The
Electrical Review

VOL. CXXIV. MARCH 3, 1939. No. 3197.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the electrical trades and has by far the largest circulation of any electrical industrial paper in Great Britain.

SUBSCRIPTION RATES, Postage free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

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Engineers and Managers

Altered Circumstances

IN his article on "Management in the Supply Industry," in our last issue Mr. J. C. Petersen again raised the vexed question of the relationship between the technical and commercial men in the modern electricity undertaking.

There are dogmatists on both sides—engineers who are convinced that technical training is the essential qualification for the manager of an undertaking and commercial men who regard such training as more of a hindrance than a help in building up a successful business.

The truth, as is frequently the case, lies somewhere in between the two schools of thought. The tidiness of mind engendered by an engineering training is a most useful background, but business is not governed by immutable laws and it is necessary for the "scientific approach" of the technician to be tempered by unscientific considerations—some purely human.

Ideal Qualifications

We should say that an engineer who possesses sufficient flexibility of mind to enable him not only to apply his technical principles to securing the most efficient production and distribution, but also to organising sales on a business basis is the ideal manager. There are many outstanding examples of the type both in municipal and company undertakings and they have been mainly responsible for electricity's rapid progress.

It was not an easy matter for chief engineers to adjust themselves to the altered nature of the electricity supply business. In its origin this business was essentially technical. Generation and distribution problems were the chief's main consideration. Ideas were uncrystallised, individual engineers held very strong views and principles which though generally accepted to-day were then only in process of formulation.

Efforts were concentrated upon increasing reliability and efficiency; this it was thought would cheapen the supply and naturally attract consumers. Even the matter of charges was considered more from the point of view of strict equity (scientifically charging each consumer his proper share of the cost) than with the idea of development.

In fact development as we know it to-day was a secondary consideration. There is a suspicion that many engineers looked upon this as a rather sordid side of electricity supply, in somewhat the same way as the aristocracy of an earlier day regarded "trade."

Eventually, however, the technical side of the business became more settled and proceeded upon definite lines. The cost of the unit was progressively reduced and the station batteries helped to smooth out the load. Presently, it became apparent that something else had to be done to fill in the very severe valleys in the curve. Definite forms of use had to be actively encouraged; in short, electricity had to be sold—it had become a "commodity."

Thus, in addition to planning their stations and distribution systems, the engineers had to enter "trade." Most of them adjusted themselves admirably to the new conditions and proved that technical ability could be combined with commercial acumen. They established showrooms, appointed salesmen and went out after the industrial and commercial consumer. Some, notoriously, did none of these things.

Emphasis on the Business Side

One effect of this reorientation was to place the greater emphasis upon the business side although the chief engineer and the manager were usually one and the same individual in municipal undertakings. In many company undertakings the functions were divided, the manager, frequently not an engineer, being the senior official.

In only one municipal undertaking is this the case. At Hull the general manager is not an engineer, a fact which recently led to the Corporation resigning from the I.M.E.A. We do not propose to enter into a discussion of this particular matter, which we believe to be a storm in a teacup, except to say that the I.M.E.A.'s requirement that the "official" representative of a member undertaking shall be the chief engineer is a legacy of the earlier days which we have mentioned.

Although as a rule engineers may still be the best managers they should not be thought the only possible men for the job. In these days when the engineering side of hundreds of undertakings has become second in importance to sales development, capable commercial men have proved themselves highly competent managers.

Superposed Generating Plant

A NOTICEABLE feature of the list of power station extensions arranged by the Central Electricity Board last year is the inclusion of a large number of stations that are not at present in the front rank for thermal efficiency. In many of these steam conditions have been chosen that should enable them to take positions in the "Fuel Returns" more in accordance with the apparent suitability of the sites for generation. In other cases the steam pressure remains at a relatively low figure and here, perhaps, for future extensions superposition of high-pressure turbines on the existing steam system will be found to provide the most efficient means of using sites which presumably are advantageous in other ways, as well as providing nuclei of local generation in national emergency. A recent example of successful installations of this kind is furnished by the Essex station of the Public Service Electric and Gas Co. (United States) where, according to *Power*, a new 50,000-kW set with initial steam conditions of 1,250 lb. per sq. in. and 950 deg. F. and exhausting into the existing system at 225 lb. has increased the station output by more than two-thirds and raised its thermal efficiency from 16.3 to 24.5 per cent.

Fine Impartiality

IT was a good idea of the Douglas (I.O.M.) Gas Light Co. to ask the wife of the Director of Education to open its recent exhibition. This lady felt impelled to explain that although she found herself opening a gas exhibition she used electricity herself. According to a local paper: "The explanation was that her husband, being a man of science, had told her that if she would only apply scientific methods to her cooking she might meet with some success! So she got an electric cooker and decided that there would be no more guesswork." Still, she conceded that that was a long time ago, and to-day gas cookers could hold their own with electric ones. But electric cookers have improved too, of course.

Air Circuit-breakers

SUCCESSFUL tests have been carried out in the United States on a new type of compact air-break switch for interrupting up to 10,000 A at low voltage. The chief feature of this switch, according to the *General Electric Review*, is a "pin-type arc quencher." This comprises a number of metallic pins insulated from one another and placed transversely in the arc chute, through which the arc is electro-magnetically repelled. The arc is broken up by the pins into short segments and its heat is abstracted by the relatively cold metal, resulting in its rapid extinction. As the duration of the arc is said to be usually less than one cycle, whereas with the ordinary type the period may be five times as much, the development is a promising one, since air-break switches for heavy duties are being increasingly used for large plants and also for controlling power-station auxiliaries.

Fully Justified

LAST week we reported Lord Monkswell's diatribe against railway electrification in the course of which he accused the Southern Railway of hiding the financial results of electrification of its system. This was forcibly countered by Mr. R. Holland-Martin, the Chairman of the Southern, at the company's annual meeting. He said: "In the electrified areas there was an increase of £180,000 [in the revenue], a very satisfactory increase and one that must make every shareholder realise how much the Southern owes to its electrified services. The capital spent on electrification in every case so far has earned a net income largely in excess of the interest required for the service of the loans." On the rest of the company's system there was a decline of £60,000 in passenger traffic revenue. So the Southern has nothing to conceal in connection with its electrified lines and it has certainly earned the appreciation of its passengers.

Honest Opinion

BOOK reviewers are often inclined to be over-cautious when criticising books which they cannot recommend. But when an author, through his publisher, sends out a book for review, he is asking for an independent opinion, and cannot complain if the reviewer exercises his independence of judgment in the direction of condemnation. Moreover, the reviewer has a duty towards his paper and its readers. He should not let the latter waste their money on books not worth buying by declining to be frank about them. Mr. Justice Greaves-Lord, in giving judgment last week in a libel action brought by an author against the *Daily Telegraph*, said that in this country things were free, and it was of the utmost importance that there should be freedom of expression in criticism so long as it was honest and kept within bounds.

Public Pressure

IN his spirited defence of the electricity supply industry at the British Industries Fair on Tuesday, Mr. H. G. Williams had little difficulty in showing that reorganisation on Post Office lines would not necessarily improve matters. It was apparent from his figures, however, that the number of consumers has been increasing at a greater rate than the kWh used by each, indicating that there is little reason for complacency. The McGowan Committee was set up as a result of public opinion, which was influenced by certain glaring anomalies, chief among which were the bewildering number of declared voltages and tariffs and the incomprehensible variations in the service provided in different areas. If this led to incorrect impressions regarding the efficiency of the organisation behind such obvious defects, the public can hardly be blamed. On the other hand, it might be claimed for the supply undertakings that they have been hampered by restrictive legislation which, originally intended to protect consumers' interests, has often had quite the opposite effect.

New Mining Regulations

THAT electricity regulations framed in 1913 should still be working well in the greatly altered conditions obtaining in mines to-day speaks volumes for the foresight with which they were drafted. A revised code is now to be prepared in the light of evidence submitted to the Royal Commission on Safety in Coal Mines. This work has been entrusted to a Committee of four, over which Professor W. Cramp, of Birmingham University, will preside. Mr. J. A. B. Horsley, the Electrical Inspector of Mines, will also be a member. Revised regulations are, nevertheless, only one aspect of the subject. Other recommendations by the Commission regarding the duties and competence of the electrical staff require to be implemented as soon as possible.

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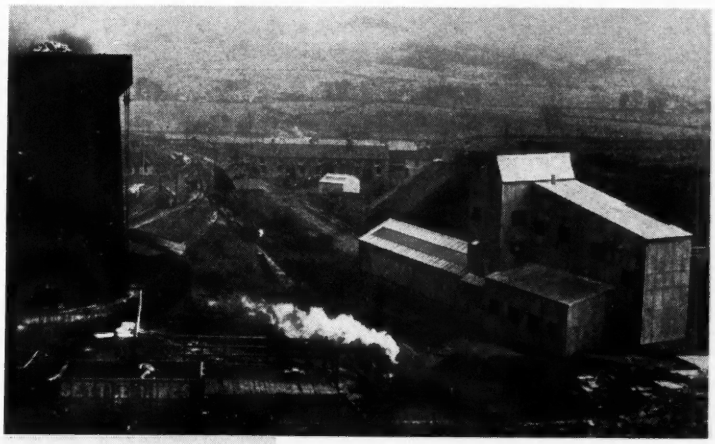
Quarry Electrification in Yorkshire

By G. E. W. Knowles, B.Sc.

(Engineer and Manager, Settle and District Electricity Co., Ltd.)

HORTON-IN-RIBBLESDALE quarry was opened just fifty years ago by John Delaney, a coal merchant, and in 1927 John Delaney, Ltd., the Ribblesdale Lime Co. and the Craven Lime Co. amalgamated to form Settle Limes, which operates four works at Horton, Ribblesdale, Langcliffe and Threshfield.

The Horton works, at which there are both limestone and granite quarries, has now an annual output of approximately 100,000 tons of limestone and 40,000 tons of granite. The products include limestone, burnt lime, hydrated lime, ground lime, tar macadam and granite chippings. There have been two large blasts in the limestone quarry, the first in 1935 bringing down 40,000 tons of rock and the second in 1937 bringing down over 60,000 tons. A similar large shot is at present being prepared at the Ribblesdale quarry and will be the first to have been fired there. Prior to electrification, the Horton plant consisted of a 450-HP Arnfield steam engine driving the granite-crushing plant, a 20-HP steam engine driving the granite hoist, a 90-HP steam engine compressor, a small producer gas engine driving the spoil tip and a compressed air winch for the limestone haulage.



General view of quarry showing new hydrating plant and one of the lime kilns

Spoil tip in limestone quarry

View inside hydrating plant showing Bates packer on the left and a hydrator in the centre driven by a 25-HP slip-ring motor

Supply at the quarry is taken from the Settle and District Electricity Co.'s 11-kV system by means of underground cable from the terminal pole of the Settle-Horton overhead line. The 11-kV supply is controlled by means of a Crompton Parkinson T.A.P. switch directly connected to a 400-kVA B.E.T. transformer. From this transformer low-voltage cables carry the supply to an English Electric 400-V high-rupturing-capacity fuse-switch main distribution board. From this board feeders take the supply to the granite plant, granite quarry, limestone quarry, hydrating plant and workshops.

The works are on three separate levels, on the highest of which are the limestone quarries, on the middle level the lime-kilns, compressor house, granite-crushing plant and offices, and on the lowest level the granite quarry. The difference in levels between floors of the top and bottom quarries is 200 ft.

Quarried stone is brought up from the granite quarry to the middle level by means of a hoist 100 ft. in vertical height driven by a 22-HP Met.-Vick. slip-ring motor through gearing. All the other motors are of the English Electric Co.'s manufacture. The granite hole is the gathering ground of a fairly considerable amount of water, the level of which is kept down by means of a Worthington Simpson pump driven by a 10-HP motor, controlled by an automatic float switch in the quarry bottom. This pump is run, when at all possible, during off-peak hours so as not to incur additional maximum demand charges.

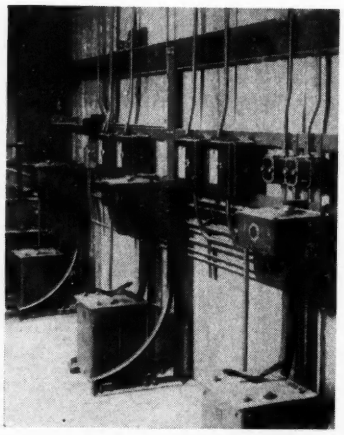
When the granite has been raised to middle level by the hoist it is brought by means of an inclined haulage into the granite-crushing plant. This plant is driven by a 175-HP slip-ring machine through a vee-rubber rope drive on to a new pulley fitted to an existing countershaft. An English Electric circuit-breaker and liquid starter are used on this machine and are proving very satisfactory.

As flexible a method of starting as possible was required because a compulsory stop may mean restarting with crushers full of stone with a correspondingly

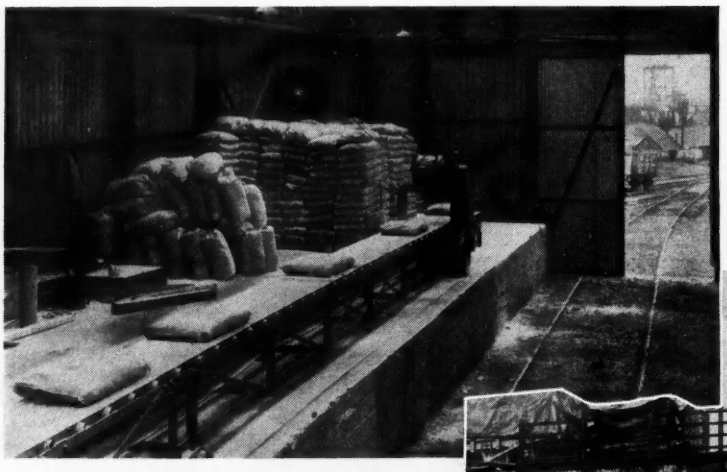
high load. This 175-HP motor replaced the 450-HP Arnfield steam engine which was forty years old and had done yeoman service. This engine, a two-cylinder compound, was fitted with a Meyer expansion gear (a comparative rarity these days) on the low-pressure cylinder for varying cut-off during on-load periods. B.I. condensers are installed in circuit with various machines for correcting the power factor, the overall value of which is 0.94.

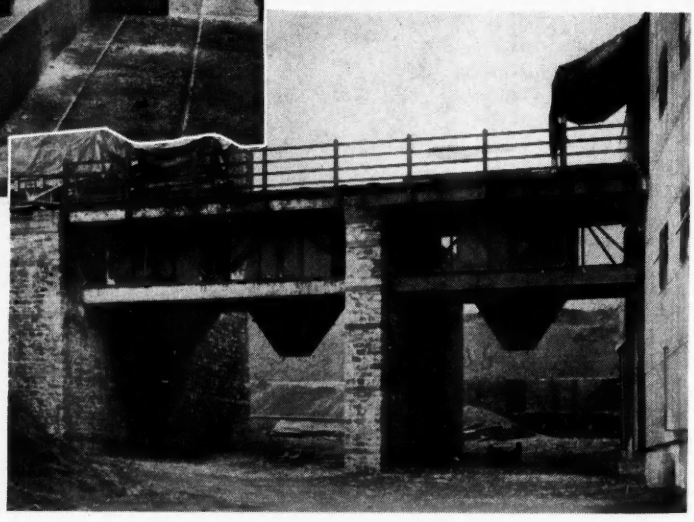
The large compressor is now driven by a 125-HP slip-ring motor through a vee-rope. On converting from the steam drive, the flywheel was removed and reversed on the shaft, the inner face being turned and drilled so as to form a half-coupling. A length of 4 in. diameter shaft carrying the other half-coupling and the driven pulley completed the drive. Compressed air is supplied to both limestone and granite quarries for boring and cutting, and is also used for warning sirens when blasting is in progress. A smaller compressor can be driven through shafting from the 175-HP granite plant motor.

All repairs either to plant or wagons are carried out on the works by direct labour. The company operates about 500 railway wagons, the bulk of orders being dispatched by rail, so that wagon maintenance is fairly heavy. In the wagon shop is a 20-HP motor driving planing and morticing machines, circular saws, &c. In the machine shop a 15-HP motor drives lathes, drilling machines and planers. In this shop is a wheel lathe on which railway wagon wheels can be turned. In Nos. 3 and 4 limestone quarries a 10-HP slip-ring motor drives an endless rope haulage which brings bogies full of stone to the kilns from different points and returns empties into lie-bys in front of the quarry face.



Arrangement of starters in hydrating plant





Above: Packing shed showing Pantin conveyor. The granite hoist headstock can be seen through the doorway. Right: Railway bridge into hydrating plant showing bunkers for loading wagons

The spoil tip, previously driven by a producer gas engine, is now operated by a 10-HP slip-ring machine. In Nos. 5 and 6 quarries the haulage is now driven by a 5-HP motor instead of a compressed-air winch.

The latest addition at the quarry is a lime hydrating plant capable of an output of 5 tons per hour. This plant receives burnt lime brought from the kilns and delivered into a 20-ton bunker by railway wagons which cross a bridge. There are also three loading bunkers for loading road wagons with lime. From the 20-ton bunker the lime is fed to a jaw crusher driven by a 20-HP slip-ring machine and then to a rotary crusher.

Adjacent to the hydrating plant is a lime-grinding plant and from the rotary crusher the lime can be fed in either of two ways, (a) to the grinding plant to be pulverised and bagged as ground lime or (b) to the hydrator. The lime grinder is driven by a 20-HP slip-ring machine and an elevator and an exhauster in this section are each driven by a 2-HP squirrel-cage motor. The lime to be hydrated is elevated to an 8-ton bin and then fed by gravity on to a table feed into the hydrator.

In the hydrator, which is driven by a 25-HP slip-ring motor, the lime is mixed with water stirred by means of large paddles. Tremendous heat is generated and the hydrate flows out over a weir of adjustable height. From this plant hydrated lime is elevated to a conveyor which feeds the 10-ft. air separator. The action of this separator, which is driven by a 8½-HP squirrel-cage machine, is to separate the hydrated lime from the tailings and impurities and drop it into the packer bin, the tailings and impurities being conveyed to a second separator. This machine takes out any hydrated lime from the tailings and passes it to the packer bin, the tailings being passed to a separate bunker for disposal for agricultural purposes.

From the packer bin the lime is bagged by a Bates twin packer driven by a 10-HP slip-ring motor and taken to the store by a Pantin conveyor driven by a 3½-HP motor. The Pantin conveyor can be moved along a tunnel and used to bring bags of ground lime to the store. All the starters for the hydrating plant are together, except those for the packer and the Pantin conveyor which are adjacent to their machines.

The power supply for the hydrating plant is brought from the main low-voltage distribution board by an underground cable feeding a sub-distribution board, which again comprises E.E. high-rupturing-capacity fuse switchgear feeding the various sections of the plant.

Settle Limes has also built an ambulance hut which is equipped with electric light, a 2-kW radiator and a kettle for use in case of emergency. Similar huts are erected at the other quarries. Electricity is also used all over the works for lighting and especially in the kilns has it been a great boon. Electric heating is used in the stores. The electrical equipment is completed by a Gents siren which replaces the old steam buzzer and is used for

(*Continued at foot of next page.*)

Supervising Electrical Engineers

Annual Dinner and Reunion

AT the annual dinner and reunion of the Association of Supervising Electrical Engineers, held at the Trocadero Restaurant, London, on Saturday, Mr. W. J. E. Binnie (president of the Institution of Civil Engineers) proposed the toast of the "Electrical Industry" in reminiscent vein, mentioning also a little booklet which set out the activities of the A.S.E.E. and showed them to be of surprisingly wide scope. In addition to education provisions, there were sick benefits and the Association undertook to help men to secure patents, which the speaker considered very important for it was the man who ran the machinery who knew how improvements could be made. Legal aid was also offered, but perhaps the most important activities were the regulation of members' salaries and the employment bureau which helped members to obtain and improve their positions.

Dr. A. P. M. Fleming (president of the Institution of Electrical Engineers), in responding, remarked that he was attending that function for the first time. Men of fortitude and physique, he said, had had to stand up to physical stress when dealing with electrical plant in the early days. From poor beginnings the industry had made extraordinary growth and its development had been phenomenal. One wondered where it was going to end. Scientifically no one could tell, but so far as technical development was concerned it would not proceed at a very great rate. One could, however, say that the combination of the attempts of technicians and workers, probing for new methods, must inevitably result in technical advancement.

The day was, perhaps, coming when turbines would be run at red hot temperatures. Electric lighting was advancing very rapidly and methods of obtaining improved lighting were being developed. Scientific discoveries would go on without end, but to take full advantage of technical developments was another problem altogether.

They, in their generation, should foster and assist the technical development, improvement and utility of the coming generation of engineers, and see to it that they were far better supplied and trained than themselves, to ensure that all along the line in every branch of the electrical industry there was a correspondingly high level of personnel and activity. The line should be advanced at the same rate, not some leading others because of bad judgment and faulty leadership. They should enthuse the various branches of the electrical industry to co-operate, not of self or single application, but by statesmanlike effort.

Mr. J. R. Beard (president of the A.S.E.E.) proposed the health of "Our Guests," describing them as distinguished representatives of different sides of the electrical engineering profession. It was most comforting and encouraging that they found time to attend on a Saturday evening to show how they appreciated the Association's activities, all of which would be referred to at considerable length in a very special edition of the silver jubilee number of the Association's journal. They were proud of what they were doing to advance their interests and took credit for the fact that they had always been very interested in proper questions affecting the industry as a whole.

1. A Maidstone group
2. At back: Messrs. B. D. Ransom and W. Sandford. In front: Messrs. C. R. Bates, J. J. Smith and W. J. Tatum
3. Messrs. J. R. Beard (pres., 1937-39), J. M. Crowdy (chairman, 1914), G. Jelley (chairman, 1938) and A. Brammer (general secretary)
4. Messrs. W. Belcher (oldest member), J. F. Chapman and C. Bull
5. A group of Birmingham members

[*Elec. Rev. photos.*

Quarry Electrification in Yorkshire

(*Continued from previous page.*)

warnings at meal times and at the end of the day. All cables, both paper and rubber insulated, were supplied by companies which are members of Cable Research. The whole of the mains and electrical gear in the quarry has been installed by the Settle and District Electricity Co.'s staff.

My thanks are due to Mr. L. Cooper, jun., general manager and a director of Settle Limes, for information supplied and permission given to publish details about the quarry.

such as standardisation, while recently they had been leaders in discussions relative to compulsory wiring regulations and registration. Attention had been given to the status and remuneration of Installation Inspectors—and a golfing section had been formed!

Mr. G. Jelley (chairman of the A.S.E.E.) endorsed the president's welcome to guests and visitors, on whose behalf Mr. P. V. Hunter (president of the N.R.E.I.C.) responded.

Mr. J. R. Beard (president) announced by way of a surprise item that the Executive Council had asked him to present gold medallions, incorporating the Association's emblem and with its motto suitably inscribed, to Mr. A. H. Dykes, the Association's first president, and to Mr. J. M. Crowdy, its first chairman, as mementos of twenty-five years' service.

Underground Cables. By J. L. Gaved

Recording their positions

AN accurate record of the position of cable lengths is as essential as the diagram of connections exhibited in the switch gallery of the power station. There is, however, a fundamental difference between the two kinds of record. With the former a diagrammatic lay-out is adequate, but with the latter an accurate reproduction of the area to a suitable scale is necessary, so that the position of any particular feeder can be immediately located in the event of a breakdown or of an extension to the cable system.

For the sake of legibility the larger the scale the better, but on general considerations of cost and time spent on the work a scale of 20 ft. to one inch has been found most convenient. This scale permits a clear delineation of an area 600 by 400 ft. upon sheets measuring 30 by 20 in.—comfortable dimensions for a medium-size drawing board.

The choice of paper should be governed by the probable value of the records for a long period. Cartridge graph-paper with divisions of tenths of one inch may constitute the ideal, owing to the ease with which points may be plotted, but in any case the completed sheets should be finished with adhesive linen backing to provide protection against the effects of frequent handling and unrolling. For those who are not averse to a greater multiplicity of sheets there is the "ten" scale from which the graph divisions provide direct reading of dimensions in single feet; but while this might be applicable to small areas it would be unwieldy and unnecessary for the accuracy of large areas.

Preparing Record Sheets

The initial procedure is to rule 25-in. ordnance sheets parallel with the edges, dividing the area into rectangles measuring 600 by 400 ft. for a 20-ft. scale and 300 by 200 ft. for a scale 10 ft. to one inch. The ordnance sheets being oriented true north and south vertically the subsequent enlarged-scale sheets will have a similar standard relationship and be complementary to them. This is a very much better arrangement than a haphazard lay-out of individual streets because in the event of loss or damage to any one large-scale sheet the area affected may be at once replotted from the key ordnance sheet, dimensions being taken off the old sheet or rediscovered on site.

In taking off dimensions from the 25-in. ordnance sheets there is no need to concern oneself with the back premises of a roadway, all that is required being the road frontages and the pavement lines or other defined edges immediately adjacent to the cable routes.

The actual plotting is very simple, consisting as it does of scaling, say the corner of a road junction, vertically and horizontally with the 25-in. scale and transferring with the 20 or 10 scale on to the enlarged equivalent 30 by 20 in. sheet. As a check upon accuracy this scaling should be alternated between top and bottom and right or left boundary lines in order that all significant points on the enlargement shall keep a true position within very close limits. This method is rapid and neat. As each sheet is completed it should be numbered to correspond with a similar identification on the "key" 25-in. ordnance sheet so that when all the sheets are assembled the whole area is reproduced to the larger scale.

It is perhaps wise to leave a one-inch margin around each sheet as a protection against wear and tear, in which case scaled lengths are taken to and from the marginal lines, unless the whole collection is to be mounted on a large roller-map assembly, when the edges will be trimmed for correct location. Permission to enlarge ordnance sheets must be obtained from the Surveyor-General of the Ordnance Department.

These record sheets should be completed well in advance of cable-laying in order that notebook sketches may be taken off them for the draughtsman's use on site each day as the work proceeds. The person making the record must be with the cable gang, accompanied by a chainman. As the trench is being opened, markings can be made at each 50 or 100 ft. according to the straightness of the run. As obstructions become revealed, such as pipes, drains, and other cables, these should be "tied off" by measurements to two points of reference on adjacent buildings thus providing a triangulation for locating the obstruction. At the same time all names or numbers of the houses or shops should be recorded on the sketch.

Positive identification of premises is important (the ordnance sheet does not give this information) and the enlarged scale sheets will then possess much greater value to the mains and sales engineers when dealing with the subsequent services to consumers. Recording should be carried out from point to point along the divisions of the chain lengths. Normally a gang of men will take from four to five hours to excavate 200 yards of good soil, so that there is ample time for unhurried and systematic measurement. The advantage of proceeding in a sequence of lengths along the trench is that, at any obstruction, there is (1) the position distance along the chain, (2) the two tape measurements to points such as dividing walls on each side of a house and (3) the width of the house.

Coincident with this procedure, the position of the trench is located, preferably from each dividing wall of the premises and more frequently where any deviation occurs. The depth of the trench and of obstructions, with particulars of size and location of pipes and drains, should be noted, together with any other relevant detail. A further quite important matter is to record the lengths of covering materials, such as pavement sets, as a check on reinstatement charges.

Finally, the position of the joints from one's own chain measurements (not from the lengths given on the drum, which may be 6 ft. in excess) and the number of the cable-drum with manufacturer's name, and the size, class and length of cables given on the drum have to be noted.

As a large area of the sheets is blank there is ample space for placing dimensions, &c., well away from the cable route with a clear arrow connecting to the reference point, and efficiency in reference may be achieved by the use of coloured inks and good printing.

In Rural Areas

Cables laid in rural areas require somewhat larger considerations but less measurements. As an example, some 400 yd. of high-voltage cable was laid across fields through which a rough cart track straggled and there was the problem of fixing location points. The method adopted was to chain along a straight line, sighted with rods which intersected the cart track at several points. This base line was run from a point on one hedge line to a point on the next hedge, these two points being located by measurements from conspicuous corners of the field, and defined by concrete markers.

Offsets taken at every 10 ft. along this line located the cable position. The cable terminated at H poles at the base of which the usual spare lengths were laid in the shape of large question marks. A curved figure of this description requires two base lines at right angles in order to locate its position accurately. The one base line was run through the centre line of the H pole legs and carried forward to a point on the nearest hedge line where it was "fixed." The other base line was run through the centre of the H pole between the two legs and also "fixed" at a hedge line. Offsets at intervals of 5 ft. or less from each line successfully located the cable's position. At several points the cable was more than 20 ft. from the H pole, illustrating the value of an accurate record.

Safety in Mines

THE Secretary for Mines announces that, in pursuance of a recommendation made by the Royal Commission on Safety in Coal Mines, he has appointed a Committee with the following terms of reference: "To be a committee to consider, in the light of experience and modern practice, what amendments are required in the General Regulations governing the use of electricity below ground and above ground at mines under the Coal Mines Act, 1911, taking into consideration the report of the Royal Commission on Safety in Coal Mines and the evidence on the subject submitted to that Commission."

The Committee is constituted as follows:—Professor William Cramp, D.Sc., Department of Electrical Engineering, University of Birmingham (chairman); Mr. J. A. B. Horsley, O.B.E., H.M. Electrical Inspector of Mines; Mr. A. M. Bell and Mr. A. B. Connell.

The secretary to the Committee is Mr. R. Crawford, and any communications should be addressed to him at the Mines Department, Mill House, 87-9, Shaftesbury Avenue, W.1.

More Light

By John W. T. Walsh, M.A., D.Sc., M.I.E.E.

Modern practice is to provide values of illumination vastly greater than those prevalent 15—20 years ago. The evidence in favour of this is examined under three headings: (1) The unrestricted choice of the individual; (2) laboratory measurements of visual performance; (3) tests under practical conditions. There is no evidence that high values of illumination are harmful to the eyes, provided care is taken to avoid glare.

NOT many years ago an illumination of 3 foot-candles was regarded as extremely liberal for reading, writing and most ordinary kinds of work. In Mr. Trotter's book "Illumination, Its Distribution and Measurement," published in 1911, there occurs (on p. 16) the following:—

> "The foot-candle is a very convenient and comfortable illumination. It is for most people a sufficient illumination for reading and is to be found on most well-lighted dining-room tables and billiard tables. More than 5 foot-candles is seldom attained in artificial illumination."

With the really extraordinary fall in the cost of artificial light which has taken place during the past fifteen or twenty years[1], however, the "standard of living" as regards illumination has risen very rapidly and in the code of "Recommended Values of Illumination" published by the Illuminating Engineering Society and referred to in an appendix to the recently issued Report of the Home Office Committee on Lighting in Factories[2], values of illumination of 50 foot-candles and over are included. The higher values are recommended, of course, for "severe and prolonged visual tasks . . . inspection of fine details," and the like, but even for reading (if continuous) or typing an illumination of 8 to 15 foot-candles is prescribed.

From time to time this modern trend towards higher values of illumination has been criticised as artificial, unnecessary or even open to objection as "bad for the eyes." If three foot-candles satisfied everyone less than a quarter of a century ago, it is argued, what grounds are there for requiring three, four or even five times as much light to-day? To answer this question convincingly is not simple. The eye is wonderfully adaptable and can work fairly satisfactorily over a very wide range of conditions. Direct evidence of the benefits of good lighting is, therefore, extremely difficult to obtain, although it is by no means entirely lacking, and it must be supplemented by arguments based on the more indirect lines of attack possible under the controlled conditions of the laboratory. The matter is of such importance, industrially and from the point of view of eyesight conservation, that it cannot be ignored.

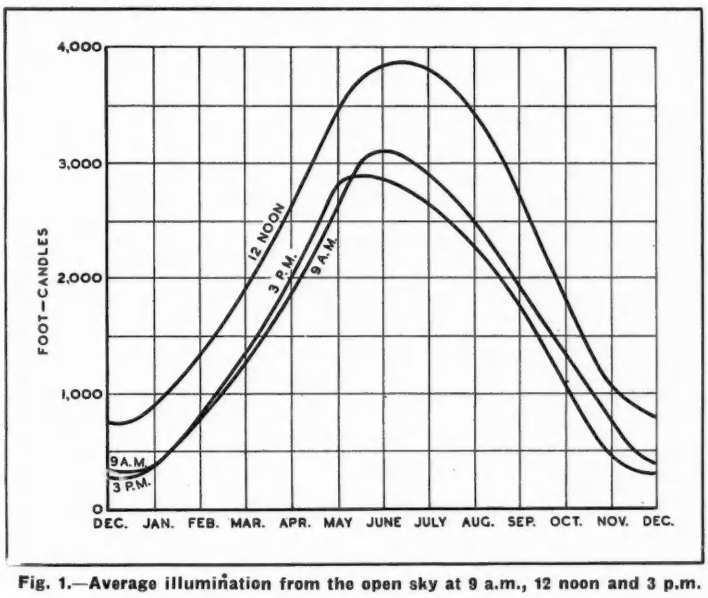


Fig. 1.—Average illumination from the open sky at 9 a.m., 12 noon and 3 p.m.

General interest in good lighting has been stimulated by the publication of the Report on Factory Lighting previously referred to, and in the following paragraphs an attempt will be made to answer the two questions: (1) "What justification is there for figures of illumination such as those included in the I.E.S. Code?" and (2) "Is there any danger or, if not danger, at least risk of temporary disability in the provision and use of very high values of illumination?"

It is probable that most people, if asked what they considered the ideal light by which to perform any visual task, especially one of an exacting nature, would reply "daylight, out of doors on a bright day, but not sunlight." It is, therefore, interesting to study the values of illumination received from the sky under such conditions in any exposed position, *e.g.*, on the roof of a building or in the middle of a field. The curves in fig. 1 show average values based on ten years observations at the National Physical Laboratory[3]. It will be seen that in the middle of the day the illumination ranges from 750 to nearly 4,000 foot-candles according to the season of the year, and it must be remembered that these values are averages for all types of weather so that on bright days the illumination must certainly be considerably higher. Even on dull days it frequently exceeds 500 foot-candles[4].

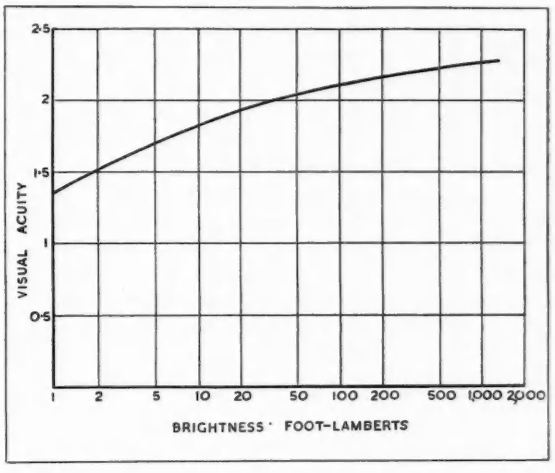


Fig. 2.—Improvement of visual acuity with increase of brightness

It appears, then, that unrestricted choice leads to very high values of illumination and this has been confirmed by a mass-observation experiment in which some tens of thousands of subjects were asked to select the illumination they preferred for a simple reading task[5]. The maximum illumination available was 350 foot-candles and the most popular choice lay between 75 and 125 foot-candles. Although these figures cannot necessarily be taken as indicating the *most suitable value* of illumination for reading, it is certainly proper, in answering the question at issue, to put some weight at least on the fact that when given a perfectly free choice of conditions the average man will provide himself with an illumination, artificial or natural, which is vastly in excess of that prescribed (for reading) in the I.E.S. code.

It has already been mentioned that the evidence provided by laboratory investigations is, generally, of an indirect character. This is because the only kind of measurement of visual performance which has been found at all reliable is a "threshold" measurement, *i.e.*, one which depends on a determination of the illumination at which the eye is only just capable of performing some given task.

An outstanding example of this is a measurement of the

[1] The number of candle-hours obtained for one penny has risen from 90 in 1921 to 400 in 1936 (based on the average lighting rate in this country).

[2] Fourth Report of the Departmental Committee on Lighting in Factories. H.M. Stationery Office, 1938. (Pp. 42-43.)

[3] Illumination Res., Tech. Paper No. 17. H.M. Stationery Office, 1935.

[4] Illumination Res., Tech. Paper No. 7. H.M. Stationery Office, 1932. (P. 9.)

[5] W. J. Jones. *Dioptric Review*, Aug., 1936.

smallest detail which the eye is capable of seeing with certainty under different values of illumination. (Usually the observer is asked to try and detect the position of a gap in a small black ring printed on a white background.) Other things being equal it is found that the higher the illumination the smaller the detail which the eye can see and fig. 2 shows how these two quantities are related[6]. It will be noticed that even at a brightness as high as 1,000 foot-lamberts, *i.e.*, the brightness of the whitest of white surfaces under an illumination of 1,000 foot-candles, the ability of the eye to detect fine details is still improving.

Another most important factor in seeing is the detection of contrasts, for it is the small differences of tone between one part of a surface and another which enable us to recognise detail in many cases of great practical importance. The individual threads in a self-coloured material, for instance, can only be distinguished because one side is in shadow and therefore darker than the other. (It may be mentioned in passing that for this reason it is well-nigh impossible to see these threads by an "indirect" system of illumination in which shadows are almost absent). Laboratory experiments have shown that the sensitivity of the eye to contrast improves as the brightness of the surface viewed increases to a value of at least 3 foot-lamberts.

It is perhaps convenient at this point to stress the fact that the important factor in seeing is not really the *illumination*, but the *brightness* of the thing seen. Evidently a surface which is dark in tone requires more illumination than one which is very white. Actually, the brightness in foot-lamberts is equal to the illumination in foot-candles multiplied by the reflection factor of the surface. As an example of what this means in practice it may be stated that the reflection factor of good white paper and white damask is about 90 per cent., while that of medium oak furniture is about one quarter of this. It follows that if the illumination in a room is 10 foot-candles, the brightness of a medium oak table will be about 2½ foot-lamberts while that of the table-cloth will be 9 foot-lamberts. This explains at once the fact that in the I.E.S. code the illumination recommended for sewing on dark coloured materials, for instance, is higher than that regarded as sufficient when the work-material is light in tone.

Tests Under Practical Conditions

As already mentioned, direct evidence of the benefit of high values of illumination is difficult to obtain owing to the extraordinary power which the eye possesses of adapting itself to hardship without, generally, any immediate protest. There are, however, two careful investigations which have been carried out jointly by the Medical Research Council and the Department of Scientific and Industrial Research and which do provide very striking evidence on the matter.

One of these investigations had for its object to determine, if possible, the relation between the size of the detail in a visual task and the illumination required to carry out that task to a specified standard of speed and accuracy. As a pertinent example of the results obtained the following will serve: if the standard aimed at for specific tasks in which

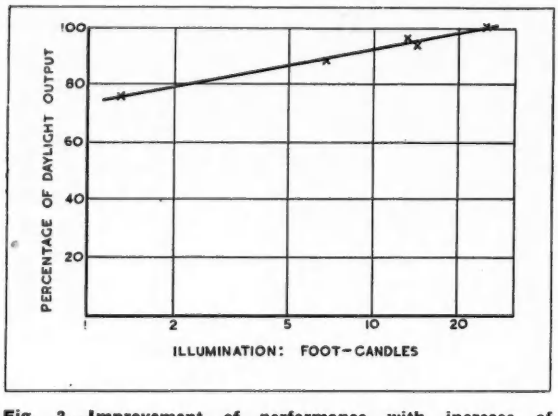


Fig. 3.—Improvement of performance with increase of illumination (typesetting)

the respective sizes of detail are as 10 to 1 (linear) is 98 per cent. of the very best performance possible in each case, then while this standard can be reached with an illumination of 1.5 foot-candles for the larger task, no less than 150 foot-candles is needed for the smaller task.[7]

The other investigation was carried out in a printing works, and in this case the task was the practical one of typesetting by hand. The results obtained are summarised in fig. 3 which shows how the performance gradually improves as the illumination is increased and does not reach the level attained under daylight conditions until the illumination is about 25 foot-candles.

It will be noticed that the scale of illumination in fig. 3 is not a linear one; it is, in fact, logarithmic, equal distances representing not equal *differences* but equal *ratios* of illumination. The reason for the adoption of this form of scale (both here and in fig. 2) is that, in common with other organs of sense, the eye appraises as approximately equal steps, not equal differences of illumination but equal ratios. For instance, a change from 10 to 11 foot-candles is almost inappreciable while a change from 1 to 2 seems quite large.

To sum up it may be said, in answer to the first of the questions asked earlier in this article, that the evidence in favour of the desirability of high values of illumination is three-fold and as follows:—

(1) When unhampered by financial or other restrictions, the eye selects a high illumination comparable with that which it enjoys when out of doors. In passing, it is worth noting that even indoors, in a room which is well provided with windows, the daylight at desk or at work-table is seldom less than 1 per cent. of that prevailing at the time outside the building, *i.e.*, it is probably between 5 and 40 foot-candles except on dull days or when the "light is failing." For fine work a position near the window would be selected and here the fraction of the outdoor daylight might well be 5 per cent. or more.

(2) Laboratory investigations show that the eye, when called upon to work at the limit of its capability, can improve its performance continuously with increase of illumination up to high (and in some cases extremely high) values.

(3) Such direct evidence as it is possible to obtain of the effect of illumination on standard of performance (output combined with accuracy) is in favour of high values of illumination, at any rate where any discrimination of detail is involved.

Are High Illuminations Detrimental?

Since the answer to the first question so definitely indicates the need for using high values of illumination, it becomes of the greatest importance to seek a reliable answer to the second question. While a categorical negative could probably not be justified, it can be said with confidence that there is no evidence whatever that, provided proper precautions are taken to avoid glare, the use of high values of illumination is in any way prejudicial to the conservation of good eyesight.[8] Indeed, inferential reasoning leads to the opposite conclusion. The eye has developed under conditions of daylight and none contends that prolonged work in daylight is bad for the eyes. The fact that artificial illuminants give a light of different spectral distribution is of doubtful relevance. In any case, electric lamps used for indoor lighting tend, as time goes on, to approach nearer and nearer to daylight in this respect.

Probably the chief cause of the frequently expressed doubt on this point is the prevalence of glare in ill-designed artificial lighting installations. The use of unshaded sources, too low a mounting height, unnecessary polished surfaces which reflect more or less blurred images of the light sources are all too frequent even to-day.

High values of illumination cannot generally be obtained without glare unless the lighting system is carefully thought out and proper shades and fittings are employed. Quite often the solution to the problem is to be found in a combination of local and general lighting though this is not always practicable. The subject is dealt with at some length in the Report of the Committee on Factory Lighting (see especially pp. 17, 18, 22, 26 and 27), and it is not inappropriate to conclude with an emphatic endorsement of its advice that "the design of the simplest lighting installation, while not unduly difficult, involves some simple measurements and calculations, and effective results cannot be expected from haphazard placing of light sources merely at convenient points of suspension."

[6] R. J. Lythgoe, Medical Research Council, Special Report Series, No. 173, 1932. (See especially pp. 31-32.)

[7] The Relation between Illumination and Industrial Efficiency (I. Effect and Size of Work) by H. C. Weston. Joint Report of the Industrial Health Research Board and the Illumination Research Committee. H.M. Stationery Office, 1935. (It should be emphasised that the figures quoted apply only to the particular tasks used in the investigation.)

[8] See *e.g.*, R. J. Lythgoe. Illum. Eng. Soc., Trans., Vol. 1, p. 9, 1936.

Fibre Ropes for Slings

A handbook (of 16 pages and 11 figs.) has been issued by the Rope, Twine and Net Manufacturers Federation as a result of investigations made regarding the safe working loads permissible for fibre ropes under various conditions of usage. "Lifting Tackle" (9d. net) is in effect a code of practice to assist users to comply with the provisions of Section 23 of the Factories Act, 1937, and to define the responsibility of the manufacturers also.

Switch and Fuse Production

A New Works at Luton

AN interesting example of industrial expansion lies in the removal of L. Weekes (Luton), Ltd., from their old and outgrown works in the densely populated part of Luton to a larger and specially built factory on the north-west outskirts of the town. On a total site area of about 67,000 sq. feet the new building, which does credit to the architect, Mr. W. H. Guest-Hubbard, L.R.I.B.A., has a total floor area of about 32,000 sq. feet, including the offices and the 15 ft. deep forecourt with a 170 ft. frontage on Wingate Road. The whole building is a one-storey structure, the factory proper being constructed with four bays with north lights and sheet asbestos roofing. The general construction is steel framing with brick and concrete filling and the south end is a temporary one of corrugated asbestos to facilitate future extensions.

We recently paid a visit to the new factory, by the courtesy of Mr. T. H. Dryden, chairman of the company, and our first impression was that unusual thought must have been given to the general lay-out of the works and equipment to afford a very high efficiency of operation, particularly with regard to the handling of materials. At the east end of the building there is a covered-in loading and unloading bay, while the north-east corner constitutes a receiving dock and the south-east corner is devoted to the dispatch of the products.

The stores runs the full length of the factory on the east side and issue counters are arranged along it so that the raw materials and components are received at the points nearest to the factory processes for which they are required. The south end of the stores is partitioned for patterns for castings and a special feature of the stores generally is the excellent installation of "Tiltracks" for accommodating all manner of components. Commanding a view of the whole works area there is at the north-east corner, with a floor level above that of the factory, a progress and foremen's department of "all-window" construction.

The factory is arranged in three sections, the fuse shop, the machine shop and the finishing department, all with a lay-out normal to the stores line so as to provide a smooth process flow from side to side of the building. The northmost bay constitutes the fuse-manufacturing department and can almost be regarded as a self-contained factory for the purpose. It is equipped for a possible output of 20,000 complete cartridge fuses per week and briefly the processes are as follows.

Fibre tubing of various diameters is cut to the required lengths by hand and the metal caps and lugs are produced in power presses. The fuse elements are also made by hand and the many bench processes involved in the filling, assembly and soldering of the units are carried out by adept hands at remarkable speed. The fuse cap is pressed out in one operation, while the clip demands four movements of the power press. Perhaps the most interesting operation to watch is the formation on some of the cartridges of the external indicators. A small wire forming a shunt to the main fuse element is arranged outside the tube and through a little recess in the cartridge filled with gunpowder, which gives the necessary indication should the fuse blow.

Bays Nos. 2 and 3 constitute the machine shop where we saw some excellent examples of all types of modern machine tools for rapid production for their particular class of work.

1. Battery of bench presses for producing fuse caps, &c. 2. Finishing and assembly section. 3. Machine shop showing a new line of machines. 4. Another view of the machine shop

Switches and switch and fuse cases probably demand the greater attention in this section and the cases and covers are machined on jigs, the operations including multiple drilling. Contact portions of switches are made from extruded bar from which the required lengths are obtained by Taylor cut-off machines before being passed to the drilling machines. The carrier unit for the movable part of the switch is a malleable casting which, after straightening, is drilled in jigs and then dealt with in the milling machine.

A particularly interesting process which Mr. A. Wilkinson, works director, showed us is the milling of grooves for rubber gaskets in the edges of fuse boxes. A dual milling machine handles the two opposite edges in one operation and the negotiation of the corners testifies to the highly skilled labour employed.

The company's watertight plug and socket for use in such places as docks, serving dock cranes and other portable equipment *via* trailing cables, is also the subject of many interesting processes in the works. We saw plug and socket housings

being produced in both gunmetal and malleable cast iron and cable boxes in cast iron. The plug pins and the sockets are produced from h.d. solid brass rod and mounted on ebonite bases.

Fitting, erecting and finishing are carried out in the fourth bay which is largely devoted to the construction of switchboards, entailing mostly hand work. The general switchboard construction is an angle-iron framework to which the sheet-steel bus-bar chamber and the switch and fuse units are bolted. At the time of our visit a switchboard was being produced for a large chemical works. It is 16 ft. long and 7 ft. high and accommodates 21 switches in sizes varying from 15 A to 300 A and in d.p., t.p., and t.p. and neutral types.

Up-to-date paint-spraying booths are a feature of the finishing section. The whole length of the fitting, assembly and finishing section (*i.e.*, the width of the factory at the south end), including the dispatch dock, is served by a three-ton runway crane.

The factory is heated by a hot-water system served by a coal-fired boiler with thermostatic control.

British Industries Fair

Concluding Electrical Functions

TO-DAY (Friday) brings to a close the largest British Industries Fair yet held, and preliminary information indicates that it has been one of the most successful. Both the Federation of British Industries and the National Union of Manufacturers report a noteworthy increase in the number of overseas buyers during the first week.

The Birmingham and District Branch of the Electrical Association for Women paid its official visit to the Fair on Thursday last week. Welcoming the three hundred or so members who attended a tea held in connection with this function, Councillor W. A. Perry, J.P., late Mayor of Sutton Coldfield, said that the Association played a very important part in popularising electricity, and had done a great deal in educating the public in its use.

Birmingham was justly proud of the Fair, which had never looked back since its inception. This year it was bigger and better than ever. Commenting on its brilliant lighting, Councillor Perry emphasised the belief that "if you light well, you sell well." The B.I.F. was a focal point of industrial life in this country, and brought manufacturers and buyers together, besides stimulating inventive genius.

Lady Nicolson, a member of the Executive Council, said that the use of electricity in domestic life had brought the home within the scope of engineering. It had, indeed, resulted in a revolution in home life.

Mr. Jeffrey Walker, chairman of the Fair Hospitality and Reception Committee presided at luncheon last Saturday on the occasion of the official visits of the Electrical Power Engineers' Association and the Electrical Association for Women (Demonstrators' Circles).

Proposing the toast of "The Electrical Industry," Lt.-Col. S. E. Monkhouse, managing director of the North-Eastern Electric Supply Co., Ltd., said that they might well be proud of the past achievements of the industry, the progress of which had been truly phenomenal. This development, however, did not occur automatically and to-day's position was directly attributable to individual efforts. The successes of the past could be maintained only by every member of the electrical industry giving of his best and not relaxing his efforts. It was seldom that an industry went on beating its own records as the electrical industry was doing.

A vote of thanks to Mr. Monkhouse was proposed by Mr. P. S. Jolin, president of the E.P.E.A., and Miss Vera Norvick, assistant secretary of the E.A.W.

The Lord Mayor (Alderman Crump) attended a tea held on the occasion of the visit of the Students Section of the South Midland Centre of the Institution of Electrical Engineers on Saturday. He said that he was glad to see so many young men taking part in what was often described as the most growing industry in the country.

The chair was taken by Mr. A. N. Jackson, a member of the Fair Management Committee and president of the Birmingham Junior Chamber of Commerce. Mr. J. E. Woolaston, chairman of the Section, was among the hundred or so members present.

Reasons for optimism regarding the future of industry in general and the electrical industry in particular, were expressed by Mr. Herbert G. Williams, executive director of the Incorporated Association of Electrical Power Companies, at a luncheon held at Castle Bromwich last Tuesday on the occasion of the official visit of eleven important electrical associations. In the early part of 1937, he said, prospects of industry suffered a set-back due to five main causes: The policy of the president of the U.S.A., resulting in a rise in wholesale prices, the introduction by the Government of the National Defence Contribution, the international tension, over-trading and over-taxation. Many of these adverse factors had now, however, disappeared. Wholesale prices had to a large extent settled down, the N.D.C. was in a different form, international tension seemed to be less than for some while, and over-trading had passed away, but over-taxation still remained.

Because we were spending vast sums of money on rearmament many people thought that everybody should be employed, but he believed rearmament caused unemployment. In the long run it was on the electricity supply industry that the electrical manufacturers were dependent for their progress. Three or four years ago the Government decided that the supply industry needed investigating, though why this should have been so he did not know; the usual practice was to investigate vice not virtue.

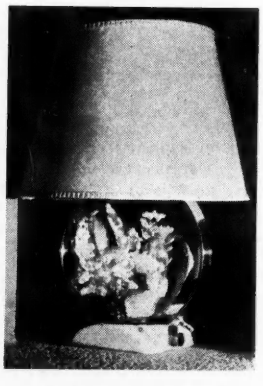
While it was agreed in certain quarters that some of the units of the electricity supply industry were too small, its progress compared very favourably with that of the Post Office telephone industry. In the ten years to March 31st, 1937, the latter had increased its customers by 86 per cent., calls by 80 per cent., and revenue by 70 per cent., the average price per call falling by 4 per cent. from 3.91d. to 3.75d. The electricity supply industry, on the other hand, in the same period had increased the number of its customers by 272 per cent., kWh sold by 192 per cent., and its revenue by 67 per cent., the price per kWh declining by no less than 43 per cent. For every telephone call made about 9 kWh of electricity was used for other purposes. When the McGowan Report was published the number of electricity consumers amounted to 6,107,000. To-day it was about 10,000,000, an increase of two-thirds in five years.

A vote of thanks to Mr. Williams and also to the Fair Authorities was proposed by Dr. A. P. M. Fleming, president of the Institution of Electrical Engineers. Mr. G. N. Guest, of the Fair Management Committee, presided. Among those present were the Lord Mayor of Birmingham (Ald. James Cramp, M.P.), Ald. Sir Percival Bower, Ald. W. Walker, Bailie Mrs. Roberts, Brig-Gen. R. F. Legge, Lt.-Col. S. E. Monkhouse, Dr. A. H. Railing, and Messrs. Harold Hobson, Walter Lines, Johnstone Wright, H. C. Lamb, Frank Hodges, C. G. Morley New, Wm. McGill and W. Riggs.

Round the London Sections

AT the Olympia and Earls Court Sections the electrical exhibits were chiefly for decoration, and among these many interesting novelties were to be found. For instance, the "Aquaflorium" flower bowl table lamp comprises a lamp over a bowl filled with water and containing fresh flowers. Owing to the air bubbles which adhere to their surfaces the flowers have a gossamer appearance.

Several attractive lighting effects were shown to us by Mr. Behr, of P. Webber, Ltd. As a believer in the merits of indirect lighting he considers that public taste in decorative lighting is lacking in appreciation. He showed us some beautiful all-silk shades, parchment shades with hand-painted pictures, and washable rhodoid effects. The use of pliable glass thonging strikes a novel note. Combed rope has also been used with pleasing results. Shelley Potteries' principle activities are in the manufacture of china, but the company will supply table lamps to match. If required the shade, too, can be made of china in the same design.



The "Aquaflorium" novelty table lamp

Sycamore and walnut are an unusual combination for floor standards, several examples of which were shown on the Mayfair Shades stand together with a chromium reading lamp giving a bright reading light with the light source completely invisible at eye level. The National Lighting Co. has had a

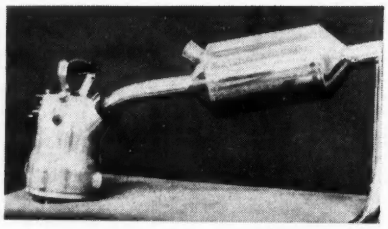
SOME OF THE STANDS AT THE BRITISH INDUSTRIES FAIR

1. English Electric Co., Ltd.
2. Westinghouse Brake & Signal Co., Ltd.
3. Jackson Electric Stove Co., Ltd.
4. City of Birmingham Electric Supply Department
5. British Electrical Development Association
6. British Aluminium Co., Ltd.
7. British Thomson-Houston Co., Ltd.

wide range of floor standards as well as electric clocks. Novelties can always be expected on A. J. Pepper's stand. This year there was a chromium-plated umbrella with a tubular lamp for a handle and a steamship with tubular lamps as the funnels. The artificial flowers, statuette of a girl and two rabbits combined with a lamp were also new this year. The etched glass table lamps of Arthur Holt & Co. were particularly effective with a glass coffee table.

The moving laughing figures among O. D. Binger's "Sales Aids" caused an interested crowd considerable amusement and would make a suitable window attraction for supply undertakings' showrooms.

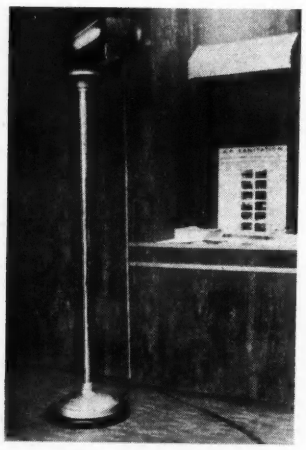
We noticed a considerable reduction of vibration in the Bylock hairdryer, due to improved balance of the motor. Four expansion springs for the suspension of the motors have also practically eliminated vibration and noise from the vacuum cleaners.



[Elec. Rev. photo.
The Welbeck heating attachment

The Welbeck cleaner has a portable motor and blower. As it is frequently used in factories requests have been received for some method of blowing hot air for drying out tanks, and the company has now produced a cylindrical heating attachment with a 1,000-W element.

There were no new "Goblin" cleaners, but a low-priced washer robustly constructed with a ¼-HP motor should have a ready market.



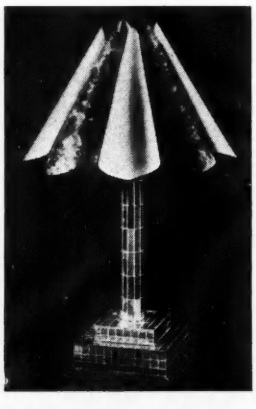
[Elec. Rev. photo.
A sectional view of the Hanovia pedestal air steriliser. A wall model is shown on the right above the show card

On the Hanovia stand this year there was the water steriliser described last week and an air steriliser. The latter strikes at 3,000 V and runs at 400/500 V, one burner dealing with 5,000 cu. ft. of air per hour. A jacket of liquid round the ultra-violet burner cuts down the ozone production very considerably. The apparatus is available in two forms—on a floor pedestal or as a wall bracket. We were interested to learn that polished aluminium has been almost entirely replaced by silver oxide. Cream is the standard finish, for which the company has now installed its own enamelling plant.

Thermega, Ltd., was exhibiting the new half-hoop heater designed for placing over the body. It has a loading of 60 W and maintains a temperature of from 85 deg. (low) to 110 deg. (high) at the base, and from 110 deg. to 170 deg. F. on the frame.

Mention should also be made of the Dominion Electrical Co.'s "Mystic" sign and "Transformation Cabinet" and also the "Ardente" outdoor loudspeaker. A wide range of ozone producing apparatus—both domestic and industrial—was to be seen on the stand of Ozonair, Ltd.

In the clock section we were particularly impressed by the appearance of the new Smiths' "Velocraft" model, the dial being surrounded by scroll work with a rich crushed velvet background.



An all-glass table lamp (Arthur Holt & Co.)

At Earls Court we saw a range of Walker Fender clock lamps and a small washer (Beatty Bros.) which incorporates a 3-kW heating element.

E.D.A. Activities

THE annual luncheon of the South-West England and South Wales (Northern) Area of E.D.A. was held at the Park Hotel, Cardiff, on February 22nd, when a distinguished company, including the Lord Mayor and Lady Mayoress of Cardiff, was present.

The toast of the "British Electrical Development Association" was given by Mr. M. Anderson, director of the Coal Utilisation Council, who said that the coal industry regarded the electrical industry as both a consumer and a competitor, and there was a danger that if the more highly priced domestic coal was driven from the home market industrial coal used for the generation of electricity would become dearer.

He hoped that the most ardent supporter of the "all-electric" house would appreciate the comfort of a coal fire, and the benefits it bestowed on the coal and other industries. More efficient generation of electricity was resulting in less coal being used per kWh generated, and this was causing some apprehension in the coal industry. Mr. Anderson saw futures for both the electrical and coal industries in expansion of electric water-heating facilities, and in the adoption of trolley-buses in place of trams. He considered the electric battery vehicle to be a good potential user of electricity and thus coal, and he considered the scheme for a standard battery on rental terms an excellent incentive to the increased use of battery vehicles.

In responding, Brig.-Gen. R. F. Legge, chairman of the E.D.A. Council, said that the Association had greatly assisted in raising the number of electricity consumers from 1¼ millions out of a total of eleven million householders in 1919 to eight millions out of twelve millions in 1938. The number of electric cookers had increased in that period from 10,000 to over 1,000,000; approximately 4,000 per week were now being connected to the mains. Rural electrification should be regarded as a most important field for development.

The toast of "Our Guests and Visitors" was proposed by Mr. E. Jones (electrical engineer, Cardiff Corporation, and deputy chairman, Area Committee), and the Lord Mayor of Cardiff responded. "The Chairman" was proposed by Mr. A. Nichols Moore (vice-chairman, E.D.A. Council). Mr. L. Howles (chairman, Area Committee) presented the prizes in the Area Public Speaking Competition to Messrs. S. H. Bates and R. F. Trott.

On the following day the annual luncheon of the South West England and South Wales Section was held at the Royal Hotel, Bristol, Mr. Hollyer (chairman) presiding. Mr. R. T. Lewis (editor, *Daily Mail*, Manchester), who deputised for Sir H. Britton at short notice, submitted the toast of "E.D.A. and the Local Executive Committee." He emphasised the part which had been played in the development of electricity by the Press, both from a national and local point of view. Mr. Nichols Moore replied to the toast, and gave an account of E.D.A.'s activities.

Mr. G. J. Hollyer (chairman, Executive Committee) also responded to the toast. He said that the South Western Area comprised 12,050 sq. miles and special attention had been paid to the main industry, *viz.*, agriculture. At the agricultural shows the electrical exhibits had become an important and popular feature.

In connection with the Area Public Speaking Competition the first prize was awarded to Mr. R. J. Coffey (Bristol Corporation), but as Mr. Coffey took first area prize last year the first cash prize (£5) was awarded to Mr. K. G. Greet (Bristol Corporation) and the second (£3) to Mr. W. Cook (Bristol). The first prize for women was gained by Miss D. Millett (Wessex Co., Newbury) and the second by Miss Jones (Bristol).

Central England Area Dinner

The Central England Area held its annual dinner at the Queens Hotel, Birmingham, on Tuesday, Mr. P. Wardle, chairman, presiding. The toast of "The City of Birmingham," was proposed by Councillor J. Hampton, chairman of the Cannock Electricity Committee, and in response Ald. H. Roberts, who deputised for Councillor Sir Ernest Canning, Deputy Mayor, who was prevented by illness from being present, congratulated Councillor Hampton on the increase in the electrical output of the Cannock undertaking.

The Rt. Hon. L. S. Amery, M.P., proposing the toast of the Association, said that there had never been anything more remarkable in the transformation of the world than that brought about by electricity in the past few years. The electrical industry employed about a million persons. Exports last year had increased by 19 per cent. over the preceding year. This had considerably helped in improving the balance of trade. The electrical industry used its own native coal, and the more electricity used the more it developed the resources of the country and improved the trade position. Considerable progress had been made recently in railway electrification in which the Southern Railway had given the lead to the world. The facts showed that electrification had been found to pay and it had increased the comfort and speed of transport. The future of the electrical industry was difficult to predict unless it was in the sphere of the wireless transmission of power. At all events the electrical industry must be used for the promotion and not the destruction of human happiness.

In response Brig.-Gen. R. F. Legge pleaded for more wholehearted and widespread support for the Association.

Meetings and Discussions

In one of a symposium of papers on radio direction-finding presented to the Wireless Section of the I.E.E. on Wednesday the problem of calibrating direction-finders for instrumental error was dealt with. A great deal of interest was taken in the paper on "The Metadyne and its Application to Electric Traction" at last week's Institution meeting. In the discussion Mr. Graff-Baker gave figures showing the extent of the reduction in brake wear on the L.P.T.B. system with this method of control.

Radio Direction-finding

ON Wednesday a symposium of papers on radio direction-finding was presented by Dr. R. L. Smith-Rose to the Wireless Section of the Institution of Electrical Engineers in London.

One of the papers, by Mr. W. Ross, was an official communication from the National Physical Laboratory and represented work done for the Radio Research Board. It described how to determine the minimum radius at which a four-aerial Adcock direction-finder might be calibrated for instrumental error without introducing spurious effects due to the proximity of the calibrating transmitter to the direction-finder.

This minimum radius depended upon the spacing of the aerials, the wavelength, and the inherent accuracy of the direction-finder to be calibrated. In most cases of practical interest it was between 0.6 λ and 3.5 λ. Such distances, while usually easily attainable on the short wave-band, might not be possible in the case of medium or long wavelengths.

It was necessary for the site in the neighbourhood of the direction-finder to be uniform. Except when the soil conductivity was exceedingly low, it was not in general necessary to allow for the effects of ground attenuation.

If the site were not uniform up to distances slightly exceeding the minimum prescribed in this paper, as, for example, would be the case if there were buried conductors in the immediate neighbourhood of the direction-finder, then it might not be possible to perform a calibration which would determine the instrumental error of the direction-finder free from the complicated effects of site error. Even in such cases, however, calibrations made at distances less than the minimum specified would be subject to the "proximity" errors described by the author.

Frequently, however, as in the case of short-wave direction-finders, the necessary condition of uniformity of the site in the immediate neighbourhood of the direction-finder was satisfied. The chief object of the paper was to give guidance in these circumstances as to the choice of a suitable calibrating radius for the determination of instrumental error.

"Metadyne" Control

A LARGE attendance was attracted to the Institution of Electrical Engineers in London on February 23rd by the paper (to which reference was made last week) on the "Metadyne" system of control for electric traction.

Mr. A. Tustin took fifty minutes to explain the principle involved, with the aid of a demonstration machine and a specially devised control board. Mr. G. H. Fletcher followed with an outline of the application of this method of control to electric trains on the London Underground railways, which occupied nearly twenty minutes. Consequently the subsequent discussion was curtailed and there was no time for the customary reply by the authors.

Mr. C. E. Fairbairn said that he had had considerable experience of the Metadyne on the Barking-Upminster line, and had spent some eighteen months discussing the economics of the system. He believed this was the first time it had really been put into operation on a large scale.

A popular idea with regard to regeneration was that it gave something for nothing, but the authors admitted that the Metadyne was more expensive than rheostatic equipment and on that account there would be additional capital charges. As to maintenance, the deterioration of the motor itself would be due to the natural deterioration of the insulation and that depended to some extent on the number of times the copper was expanded relative to the insulation. It seemed to him that the more times the current was switched on and off, the more times that effect would be produced.

In the case of the Metadyne the current was switched on twice between the start and the stop, so that the time between the rewinding of motors would be shorter than with rheostatic equipment. Further, the life of the shaft, gears and bearings depended on the amount of work they did, and with Metadyne control they did twice the amount of work between start and stop. As the motors had to regenerate, they had to be bigger and so would be a little more expensive than with rheostatic control and, moreover, control apparatus could not be less than with rheostatic equipment.

It was true that there were savings in energy and in brake blocks, but these savings had to be balanced against extra maintenance costs, and it was also necessary to include sub-stations as part of the yearly cost. Sooner or later the sub-stations would have to accept some regenerated current, and on the South African railways they had had to put in two tanks per rectifier instead of one, which meant increased capital costs.

Inventor Foresees Other Applications

Prof. J. M. Pestarini, the inventor of the Metadyne, who had come from Turin specially to attend the meeting, said that although the first machines were built in France, the Metadyne had found its greatest application in England, and he expressed his indebtedness to the pioneer spirit of English engineers and particularly to the authors for the development that had taken place. He believed the system could be used not only on railways but in a very much wider field, and he was confident that it would not be long before English engineers would be giving information about other applications.

Mr. J. E. Calverley pointed out that the current was not constant at all but controlled. The Metadyne reminded him of the Thury machine of 30 years ago, on which both Mr. Fletcher and himself had worked. The design of interpoles was tricky and credit was due to the authors for getting such good commutation on the Metadyne. The back EMF must be opposite to, and almost equal to, the line voltage; therefore it must vary with the line voltage and the secondary current would fluctuate as the line voltage varied. That being so, what provision was made on the Metadyne machine to compensate for the changes of line voltage, between 570 and 700 V?

The paper was not very clear with regard to regeneration. It was stated to be from 25 to 30 per cent. of the motoring energy when measured at the train, but he presumed that was the energy input to the Metadyne. How did it compare with equipment having normal resistance control? No mention was made of efficiency in the paper, but the Metadyne was running all the time the train was in service, and was even turning over when the train was standing. There was no greater simplicity with Metadyne equipment, but great credit was due to the London Passenger Transport Board for focusing attention on the possibilities of dynamic control.

Other Methods

Mr. H. Charnley remarked that while the operating characteristics of the Metadyne were exactly what were required for electric traction it required a great deal of control and was complicated. It might well be that similar operating characteristics could be obtained by an automatic counter-voltage system. A machine designed by Burge and McFarlane and developed by Crompton's in 1911 was not unlike the Metadyne in many respects. It was described in a paper before the I.E.E. in 1912, but designers came to the conclusion that very similar characteristics could be obtained by a straightforward machine like a motor-generator set. Constant current could be obtained by the use of suitable shunt field contactors and an accelerating relay, and plain series motors would avoid "entry" problems and surge currents.

After criticising the size of the machine and the large amount of iron in the core, which was said to reduce efficiency, Mr. Charnley agreed that the Metadyne was the only machine so far that had the very desirable characteristics which everyone was looking for in motor coach working, but said that it was not suitable for locomotives where the gear must be under the direct control of the motorman. On the whole, however, he regarded it as a great step forward, and added that the London Passenger Transport Board had started a new era in electric traction by adopting it.

Dr. E. Rosenberg implied that the Metadyne had advantages over a motor generator with Ward-Leonard control, adding that he hoped the authors would state the difference between weights and efficiencies. In 1905, when he published the first forerunner of the Metadyne, he called it a two-phase DC machine because there were great similarities, but that name

Direction-finding Problems
Views on "Metadyne" Control
Sources of Power

was never accepted. It was remarkable how, without any mathematics, the paper had made clear in so few words that this machine could translate constant voltage into constant current.

Mr. W. Graff-Baker expressed the view that Mr. Fairbairn was not quite right in his assumption that because the motor in the case of the Metadyne was switched on twice between start and stop maintenance would be higher. The fact was that it was less likely to experience temperature changes such as an ordinary traction motor did.

On the results so far he was not in any sense dissatisfied. Brake blocks were one of the London Transport Board's chief preoccupations. Actually, with 3,000 cars in service it ground to powder some 4,000 tons of cast-iron every year and that metal dust was not uncommonly found mostly in the electrical equipment. However, the claim that the Metadyne effected a saving in brake shoes had been justified, for on the Hammersmith-City line the life of the brake blocks was 800 miles with a heavier train and a slightly higher speed at the point of braking as compared with an average of 540 on the remainder of the system. The saving was not only in the brake shoes, but also in the labour involved in replacing brake shoes.

Several speakers had appeared to be horrified at the amount of electrical equipment required but, to take one point, contactors were small and were not specially troublesome, nor indeed were large contactors.

In their calculations before the adoption of the Metadyne in no case did they count on any energy being absorbed by the sub-stations. The economics had to stand on the basis of regeneration absorbed into the track and into any train working in that section. With 40 or even 20 trains to the hour it was not too difficult. They had excluded entirely those parts of the line where there was a lot of traffic and also certain parts of the line which were not receptive.

Current saving could not be measured at the train. It must be done at the sub-station, and it was his intention very shortly to work one week with regeneration and one without.

The Steam Cycle

THE informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS held on February 20th in London was concerned with "The Steam Cycle," a specialised subject which nevertheless attracted a good attendance.

The introductory remarks of Mr. E. L. Luly were illustrated with graphs of efficiencies under varied grades of pressure and temperatures, making it clear that he had achieved considerable success in bringing together all the factors upon a common basis for comparison. To keep the problem within defined limits the curves started from a load factor of 30 per cent. and indicated the efficiencies obtainable under various operating conditions.

In the discussion Mr. Luly was complimented on his general survey of the questions that affected the choice of plant and for his skilful effort in showing that considerations of operation efficiency were secondary to those afforded by the steam cycle. He made it clear that the best results had been obtained with feed temperatures and indicated where further effort would be worth while.

Auxiliary Plant in Power Stations

POWER station auxiliaries were dealt with in a paper which was read before the Manchester Local Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on February 23rd by Mr. Vernon Walker, assistant resident engineer, Chamber Hall Power Station, Bury, Lancs.

The author discussed factors that determined layout, the effects of system disturbances on auxiliaries, general reliability and maintenance, trend in design, the amount of standby to be provided, various types of motor available for different services, and the general requirements of control gear.

The amount of power used for auxiliary purposes varied considerably, averaging between 4 and 5 per cent. of that generated; 42 per cent. for the draught plant, 25 per cent. for pumping boiler feed water, 6 per cent. for coal and ash handling, stokers, &c., 22 per cent. for condenser circulating water and 5 per cent. for turbine auxiliaries, drain pumps, &c.

The rupturing capacity of auxiliary control gear was often of the order of 25,000 to 40,000 kVA. Straight-on starting was now being employed in large power stations, thus simplifying control, the overload relays being in some cases cut out during the starting period. The starting torque required by centrifugal pumps and draught fans need not exceed 30 per cent., but most auxiliary motors were started at full voltage (3,000 to 6,000 V three phase for large motors and 440 V for the smaller), so that full starting torque ranged between 100 and 150 per cent. They were sometimes specified to carry full load at 66 per cent. voltage, which required the running torque to approximate to 225 per cent. For stokers and coal feeders more torque was needed at minimum than at maximum speed.

A new development in auxiliary drives had been adopted at one modern high-efficiency power station in which the fans, stokers and reciprocating feed pumps were driven on a modified Ward-Leonard system. The high pressure primary turbine would be supplied with steam from two boilers, each having its own auxiliary generator coupled by gearing to the low pressure condensing turbine. A small booster would determine the strength of the field of these generators and control the output of the boiler house. Each boiler had also a controller to regulate the voltage of its own generator.

A motor-generator set was provided for stand-by and starting purposes. The remaining auxiliaries were driven by AC motors supplied from a house set directly coupled to the primary turbine.

World Power Sources

SOURCES of world power were discussed in a paper by Prof. W. Cramp (Birmingham University) which was read to the BIRMINGHAM ELECTRIC CLUB on February 27th.

It was explained that the use of power meant transforming energy from one form to another, and ultimately the end attained was an increase of molecular kinetic energy. All sources of power depended on one or more of three mysteries, namely, electrical force, molecular force or gravitation.

Dealing with stores of energy that could be released, he said the disintegration of the elements might be compared with the fossil fuels. The chief objection to the former was the low rate of disintegration, which therefore compelled at present the use of other fuels. The amount available, as well as its position on the earth, had a great bearing upon the economical provision of power and hence also upon the position of industries. Figures and maps, showing these quantities were exhibited.

With regard to stores of energy that were continually renewed, he said that many sources as yet hardly tapped would gradually become more common, and others tend to disappear. Among the former, the wider use of vegetation might be quoted. At present, water power was the outstanding instance in this class, and figures were quoted of its position and availability.

The use of the tides was also mentioned, as well as the possibility of the direct use of the heat of the sun. The paper closed with a forecast as to the probable trend of development of the use of these sources and its effects upon the location of industries.

FORTHCOMING EVENTS

Institution of Electrical Engineers.—Thursday, March 9th. Institution, London, W.C.2. 6 p.m. "The Design and Operation of Hams Hall Power Station," by Mr. F. W. Lawton.

Transmission Section.—Wednesday, March 8th. Institution, London, W.C.2. 6 p.m. Joint meeting with the Chemical Engineering Group. "The Corrosion of Underground Cables," by Messrs. W. G. Radley and C. E. Richards.

Mersey and North Wales (Liverpool) Centre.—Monday, March 6th. Liverpool Royal Institution, Colquitt Street. 7 p.m. "Superimposed Control Applications with special reference to Tariffs and Load Levelling," by Mr. D. J. Bolton.

South Midland Centre.—Monday, March 6th. James Watt Memorial Institute, Great Charles Street, Birmingham. 7 p.m. "Ham's Hall Power Station," by Mr. F. W. Lawton.

Hampshire Sub-Centre.—Wednesday, March 8th. Municipal College, Portsmouth. 7.30 p.m. "Recent Progress in Power Rectifiers and Their Applications," by Dr. W. G. Thompson.

Dundee Sub-Centre.—Thursday, March 9th. University College, Dundee. 7.30 p.m. "The Empire State Building of New York." by Mr. H. S. Allingham.

Birmingham Electric Club.—Friday, March 3rd. Grand Hotel, Birmingham. 6.50 p.m. Annual dinner.

Association of Mining Electrical Engineers *(West Wales Branch).*—Saturday, March 4th. "Mine Lighting—Where are we?" by Mr. C. C. Bleach.

Lothians Branch.—Saturday, March 11th. "Mining Electrical Plant Development." by Mr. T. Borland.

Yorkshire North-West Branch.—Saturday, March 11th. Leeds. Annual dinner.

Electrical Power Engineers' Association.—Tuesday, March 7th. Caxton Hall, Westminster, S.W.1. "Power Supply to Station Auxiliaries," by Mr. J. F. G. Shaw.

Diesel Engine Users' Association.—Wednesday, March 8th. Caxton Hall, Westminster, S.W.1. 4.45 p.m. "The Utilisation of Waste Heat from Diesel Engines," by Mr. H. J. Fountain.

Batti-Wallahs' Society.—Wednesday, March 8th. Hotel Victoria, S.W.1. 12.30 for 12.55 p.m. Luncheon to Rev. R. R. Hyde. "The Development of Industrial Welfare."

Electrical Development Association *(North-West England and North Wales Area Committee).*—Thursday, March 9th. Midland Hotel, Manchester. 12.30 for 12.45 p.m. Annual luncheon.

Physical Society.—Friday, March 10th. Imperial College of Science and Technology, South Kensington, S.W.7. 5.15 p.m. Annual general meeting.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Jute-insulated Cables

WITH regard to Mr. Llewellyn B. Atkinson's article about the C.M.A., and Mr. Snow Huddleston's letter in your issue of February 24th, in 1884 or 1885 I bought jute-insulated lead-sheathed cable from the Silvertown Co., used it on Brush arc light circuits at Eastbourne and found it so satisfactory that I became a convert to the fibrous type of cable dielectric thenceforth.

I believe that the originators of the jute rosin-impregnated lead-sheathed cable were the Swiss firm of Berthould Borel, which is still going strong. It is quite possible that the Silvertown (I.R. & G.P. Co.) bought the cable they sold me in 1884/5 from that firm, but that is only a guess.

I had previously had some Callender vulcanised-bitumen cable in the same service, as the original vulcanised-rubber cables had not done too well on the arc circuits. I have a notion that my order given to Mr. Callender, senior, personally, was the first he had taken for anything that could be called high-voltage work, but of that I have no proof; it was about 1883/4. HENRY M. SAYERS.

Beckenham, *February 25th.*

Small Pumping Loads

I was much interested in Mr. A. Stewart's article in your issue of February 10th as I have for some years advocated the use of electric pumps, preferably AC, worked off the public mains, as being the cheapest and most reliable system of obtaining a pumped supply of water, besides providing a steady and adaptable load for the undertaking. It rather surprises me, however, that Mr. Stewart does not mention electric bore-hole pumps with submersible electric motors. There are now pumps of this type that are most reliable and are cheap to install and maintain. No housing or protection is required, as the pump and motor are at the bottom of the bore-hole. These pumps have many other advantages, *e.g.*, they need little attention, they are best suited for pumping deep bore-holes, where a long shaft drive would be expensive, and annual examination is sufficient since the bearings are water lubricated. The plant is merely suspended down the bore-hole on the delivery pipe, and the bore need not be vertical or true. It can be placed in any position below the surface and covered by growing shrubs or vegetation so as not to be apparent or liable to damage by air raids.

Control can be automatic from a distance if needed, and the delivery can be against an air pressure system instead of having a storage tank.

Such pumps have been long used in the Navy for salvage. Portable AC generators with crude-oil engines could be used to give the supply if the public supply should fail or be destroyed. Why not have these bore-holes ready in selected positions, and the pumps installed or in stock ready for immediate use?

T. L. REED COOPER, M.I.Mech.E.

London, W.5. *February 25th.*

Radio in a Change-over

As manufacturers of radio change-over equipment for a number of years, we have come into contact with a large number of consumers in London and also provincial centres.

Although it was not our concern as to the exact arrangements made between the supply authorities and individual consumers, we observed that in practically every case the consumer was supplied with complete apparatus, placing him electrically as he was before the change-over. In other words, the additional plant installed was sufficient to give him completely his DC requirements for all purposes.

TUNEWELL NEON & RADIO, LTD.,
B. ROSTEN, B.Sc.(Eng.), Grad. I.E.E.

London, N.11, *February 24th.*

As I read Mr. Brown's letter, his radio set operated (as a self-contained unit) continuously by merely switching it on to the mains before the supply was changed to AC. He now has fears that it will not continue to do this on the present supply. When it ceases to function will be the time to take the matter up with the supply company. The reason (technical) for its failure, when it takes place, should be no concern of his.

February 24th. A. POINT.

The I.M.E.A. Proposals

Effect of revision of articles

THE extraordinary general meeting of the Incorporated Municipal Electrical Association to consider resolutions for amending the Articles of Association is to be held on March 13th at the Houldsworth Hall, Deansgate, Manchester, not in London as was first proposed.

Two resolutions are to be put forward; the first, a lengthy one, sets out the alterations proposed in a number of the articles, particularly No. 24. The substituted article lays down the composition of the Council for the years 1939-40, 1940-41 and 1941-42 and from the ordinary general meeting of 1942 onwards.

The articles dealing with the methods of nominating and electing representatives to the Council are also considerably revised.

The second resolution revokes By-laws Nos. 2 and 4 and substitutes as from April 1st, 1939, a new scale of annual subscriptions for that now in force. The new scale is as follows:—

Undertakings having sold at the end of the previous Financial Year—	Annual Subscription. £ s. d.
Under 2½ million kWh	5 5 0
2½ million kWh and under 5 million kWh	7 7 0
5 " " " 10 " "	10 10 0
10 " " " 15 " "	17 17 0
15 " " " 20 " "	23 2 0
20 " " " 25 " "	28 7 0
25 " " " 50 " "	32 11 0
50 " " " 100 " "	42 0 0
100 " " " 200 " "	52 10 0
Over 200 million kWh	63 0 0

An explanatory memorandum accompanies the resolutions. This makes brief mention of the events leading up to the March 13th meeting and shows how the revision operates.

At an extraordinary general meeting held on January 26th last certain proposals were submitted for amending the Articles of Association but they were not accepted by the necessary three-fourths majority. The Council has since reconsidered the matter and the proposals now submitted to members were unanimously adopted at a meeting held on February 9th. The present proposals differ from those submitted to the meeting on January 26th in the following respects:—

Whereas it was proposed then that the Council should ultimately consist of: (*a*) Six officers of the association; (*b*) three local authority and five engineer representatives of members in each of the Groups A, B and C; (*c*) representatives of the Centres (four); and (*d*) one honorary member of the Council, it is now recommended that the Council, when fully reconstituted, shall consist of: (*a*) a president; (*b*) one vice-president; (*c*) one immediate past-president; (*d*) four local authority and six engineer representatives of members in each of the Groups A, B and C; (*e*) one representative of each Centre (four); and (*f*) one honorary member, making a total of thirty-eight members in the Council, instead of thirty-five as at present.

Election of Officers

Contrary to present practice the hon. treasurer and the hon. secretary will be appointed each year by the Council from among the ordinary members of Council. The president and vice-president will be elected by the whole body of members as at present, but the election of ordinary members of Council will be by three Groups, A, B and C, defined as in the previous proposals of the Council. Each Group will elect its own representatives.

The scale of subscriptions is revised and graduated more steeply—the undertakings with the greater output paying increased subscriptions while undertakings with the smaller output pay less. The effect of this change is an immediate reduction of £567 per annum in aggregate subscriptions, but it is estimated that this loss will be made good in a few years' time owing to the normal expansion of the industry. In the meantime, the reserve fund is adequate to meet any likely emergency.

The other proposed amendments to the articles are those which were submitted to the general meeting of members on January 26th.

Parliamentary News

(BY OUR SPECIAL REPORTER)

The White Paper Proposals

IN the House of Commons on February 22nd Rear-Admiral Beamish asked the Minister of Transport what was the position with regard to the postponed legislation for amalgamation of electricity undertakings; and in what respects the policy outlined in the departmental paper of 1937 had been modified.

Mr. Burgin said he could not add to the statement made by the Prime Minister on November 10th. In these circumstances it would be premature for him to attempt to summarise the result of discussions on the departmental paper referred to.

Central London Electricity Charges

Mr. Magnay asked the Minister of Transport if he was aware of the growing indignation among the consumers served by Central London Electricity, Ltd., at the very heavy increase in charges now being made under the company's recently introduced commercial two-part tariff; that consumers for lighting only were being penalised as against those who used electricity for both lighting and power; how it was that consumers served by the company had to pay a standing charge for lighting of £16 2s. 6d. as compared with £9 9s. in Battersea, £10 in the County of London, and £10 or less in many provincial centres; and would he take steps to ensure that consumers for lighting in Central London should have electricity at a price comparable with that charged in many places in the provinces.

Mr. Burgin said he understood that the company had recently introduced a revised two-part tariff; he had no control over the terms of this tariff. Consumers who took a supply for lighting only had the option of being charged on a flat rate.

Revision of Tariffs

Mr. Magnay asked the Minister of Transport whether any all-round revision of electricity tariffs was under consideration; if such revision would be aimed at standardisation of charges and the removal of the anomalies which at present existed; and if he would use his good offices in such direction.

Mr. Burgin said he had no information which would lead him to believe that electricity undertakings generally were considering any all-round revision of tariffs.

Television Licences

On February 27th Mr. R. Morgan asked the Postmaster-General the present approximate number of licences in force in respect of television receivers; the approximate annual revenue therefrom; what had been the annual cost of the television service since its introduction; and who had borne the difference between this cost and the revenue.

Sir W. Womersley, the Assistant Postmaster-General, said that the reception of television was at present regarded as covered by the ordinary wireless receiving licences and no special television licence was required. He was informed by the British Broadcasting Corporation that the annual revenue costs of the television service, together with depreciation on capital expenditure, were: In 1936, £111,500; in 1937, £277,149; and in 1938, £352,846. The proportion of the revenue from wireless licence fees paid to the Corporation during these years was increased to take account of the estimated cost of the television service.

Holding Companies

THERE is a strong feeling at Westminster that the Government is behind the motion which the Earl of Onslow, Chairman of Committees in the House of Lords, is to move on March 14th when he will ask the House to agree to appoint a Select Committee to investigate the effect of the acquisition by holding companies of gas, electricity and water undertakings which operate under statutory restrictions imposed in the public interest. There is, in Government circles, some apprehension lest the safeguards imposed by Parliament on public utility undertakings for the protection of the public may be rendered of no avail by the acquisition of the control of these undertakings by holding companies which are not themselves subject to any statutory control. It is believed that a strong committee will be formed and that its proceedings will not be delayed by any formalities. An early report is looked for.

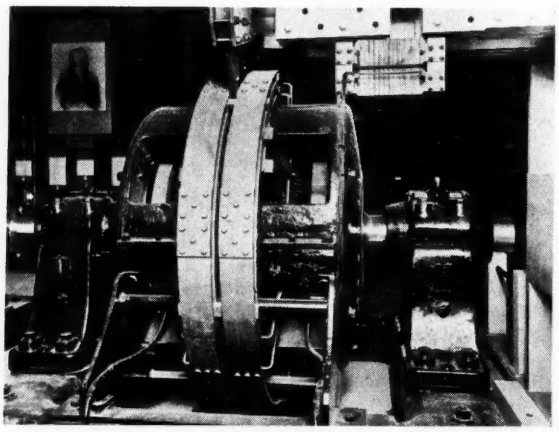
The full text of Lord Onslow's motion is:—"That a Select Committee be appointed to consider in the case of gas, electricity and water undertakings operating under enactments containing provisions regulating the raising of capital, the borrowing of money, the charges to be made, or the relation between dividends and prices charged, whether the control of or by such undertakings by or of another body (statutory or otherwise) can impair the efficiency of such provisions; and whether, in the case of Bills and Orders relating to any of such undertakings and promoted for the purpose *inter alia* of obtaining or increasing capital or borrowing powers, provisions should be made for the control of the exercise of such powers as to terms or form; and to report what, if any, modifications or additions to the provisions usually inserted in local Acts and Orders should be made with a view to their incorporation in future Bills and Orders relating to gas, electricity and water undertakings."

Unusual Generator Design

A DC generator designed to produce 50,000 A at 14 V for experimental purposes has been built at the Office National des Recherches et Inventions in Paris. It is constructed on similar lines to the original Faraday generators, with a solid iron rotor which acts both as a revolving magnet and as a conductor of induced current, but it is not perfectly cylindrical.

The central section is of somewhat larger diameter than the rest, so that two annular surfaces are provided near the centre of the rotor against which the brushes can bear. This arrangement avoids the radial vibration to which brushes bearing on the surface of a cylinder are liable, and so ensures better contact and less voltage drop between the brushes and the rotor. Another advantage of this arrangement is that equal currents flow into every brush. The brushes are grouped in fours, each group being fixed in a holder placed radially. Fifty holders on each side of the projecting portion of the cylinder make a total of 400 brushes, half positive and half negative.

To compensate for reaction peculiar to machines of this type the stator is provided with two steel rings on which the brush holders are mounted. They are insulated from each other and from the mass of the stator. When current passes through the rotor in one direction each of the rings carries half that value in the opposite direction. The reaction in the stator



The 50,000-A, 14-V generator at the Office National des Recherches et Inventions, Paris

created by the current in the rotor is thus annulled by the opposite reaction in the stator set up by the current in the two rings. The stator windings are composed of copper bars, 80 mm. by 2 mm., each two bars in parallel, and have independent excitation.

The results obtained with this machine have caused French engineers to reconsider whether for special purposes requiring very large low-voltage currents machines of this type might not have advantages over those of more conventional design.

Recent Loan Sanctions

DURING the period of four weeks ended February 25th the Electricity Commissioners sanctioned the borrowing by public authorities (joint electricity authorities, joint electricity boards and local authorities) for electricity supply purposes of a total sum of £2,530,160, made up as follows:—

Purchase of property	£82,474
Generating station buildings	310,992
Buildings for distribution purposes (including £3,388 for showrooms)	38,032
Plant for generating stations	709,496
Plant for distribution	181,128
Mains extensions, house services, meters and instruments	691,084
Consumers' wiring installations and electrical apparatus, etc.	516,954
	£2,530,160

The total includes the following individual sanctions for amounts of £250,000 or more: Plant and building extensions at the Townmead Road generating station, Fulham, (£600,000 and £300,471); meters and consumers' electrical apparatus for Birmingham Corporation (£300,000).

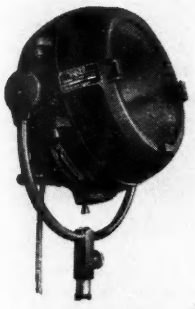
The total amount sanctioned for the period from April 1st, 1938, to February 25th, 1939, was £22,015,956, which compares with £16,022,597 for the period from April 1st, 1937, to February 25th, 1938.

NEW ELECTRICAL PRODUCTS

A review of equipment recently marketed

Photographic Lighting

A RANGE of lighting equipment for industrial and commercial photography is announced by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, which has set aside a special department to deal with photographic illuminating engineering.



The 2-kW combined spot and floodlight

One item is a 2-kW studio effect illuminator that can be focused at a distance of 10 ft. from a spot 18 in. in diameter to one of 8 ft. diameter, with single hard shadows for effect, accommodating either a 1-kW or 2-kW flat-grid filament bi-post studio projector lamp. This unit is built upon two aluminium castings and is hinged about the horizontal axis of the lens for access to the interior. A double-pole mica mounted switch is built into the rear, and connection is made by a two-pin pistol grip holder with side earthing strap.

Another item is an overhead reflector with twelve 1,500-W "Osram" lamps in holders set at an angle, so that the lamps are vertical when the reflector is tilted at 30 degrees. Separate double-row fuses serve as isolating links, when desired, for each of the three rows of lamps.

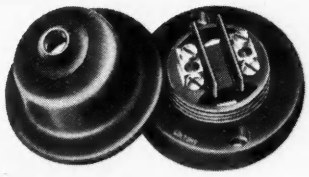
For general photographic studio work there is a projector containing a 2-kW filament lamp with special focusing screws and the mirror is so mounted that it may be removed for cleaning or lamp changing and replaced without disturbing the focusing.

Among portable units for portrait and commercial work is a 500-W table reflector constructed of aluminium and having a double reflector let into the side.

A studio reflector designed to accommodate one 400-W "Osira" mercury vapour lamp and two 300-W tungsten lamps gives an intensity equivalent to that derived from tungsten lamps of 1,800 W and abolishes the need for colour filters.

Improved Ceiling Rose

From Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester, we have received a sample of a new ceiling rose with solid block terminals in place of the old style of stamped plate with riveted terminals.

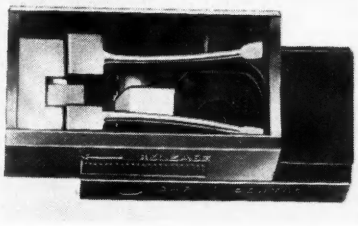


The "Goltone" ceiling rose

Wiring is simple although the interior is moulded in one piece with the casing, and the cord grip will withstand a strain considerably greater than is likely to be applied.

Holder for Architectural Lamps

For use with architectural lamps the British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2, has brought out the type "E" lampholder for peg caps. The lamp locking is achieved in this case by sliding into position the upper section of the holder and the cap is inserted without obstruction at the divergent ends of the rigid strip contacts.

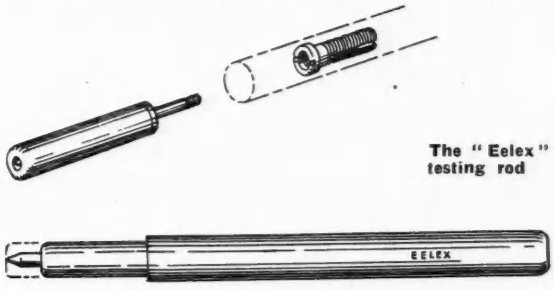


The type "E" B.T.H. holder for tubular lamps in the open position

The single-hole fixing is central to the holder and coincides with the actual cap centre, thus reducing the wireman's work in positioning the holder, which can be fixed at any angle without affecting the position of the fixing hole or the operation of the release. This is a useful feature when working with survey lamps. The connecting block at the back of the holder is provided with two wire inlets each with a separate deeply recessed grub screw.

Testing Prods

The accompanying sketch shows a testing prod recently introduced by J. J. Eastick & Sons, 118, Bunhill Row, London, E.C.1. This can be made in practically any length and the head is protected and shrouded until contact is required,

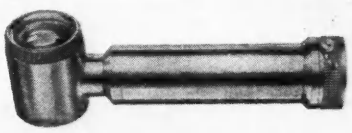


The "Eelex" testing rod

when slight pressure pushes the sleeve back and exposes the contact. A half turn of the sleeve in the backward direction locks the point in the exposed position.

The "Luminoscope"

An unusual illuminated microscope known as the "Luminoscope" has been placed on the market by Castelco (Great Britain, Ltd., 91/93, South-wark Street, London, S.E.1.

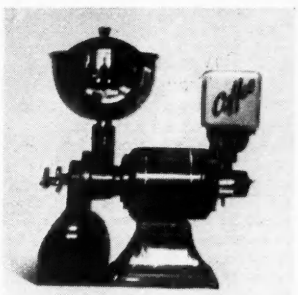


The "Luminoscope"

The lens in the head is so arranged that a 1½-V bulb, operated from a battery in the handle, directs its rays downwards on to the work being examined yet it causes no dazzle when the user is looking directly into the microscope. The glass gives a magnification of twenty times and the whole outfit measures 5½ in. long by 1½ in. wide at the head.

A Small Coffee Mill

A counter type coffee mill is now being manufactured by Zachariah Parkes, Ltd., 47-48, Hampton Street, Birmingham, 19. The case-hardened grinders have a capacity of ½ lb. per min. Special grinders can be fitted for the finest Turkish coffee. The receiver is directly suspended underneath the grinding chamber and the hopper is vase-shaped and chromium plated. The drive is by a ¼-HP motor and a small illuminated sign "Coffee," as shown in the illustration, can be supplied.



The Parkes "Junior" coffee mill

Sink-type Washboiler

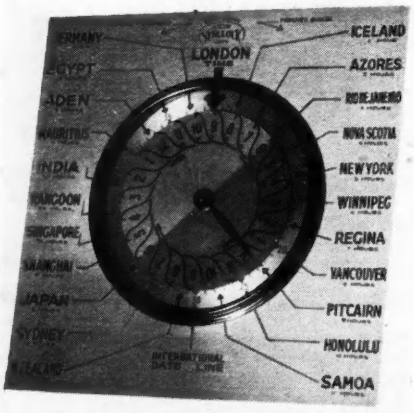
The sink model washboiler introduced by the Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1, has a pressed aluminium top with a lip to overlap the kitchen sink, the tubular legs being adjustable for height in ½-in. stages. A hinged white-enamelled draining board covers the top of the machine when it is not in use. A continuous working automatic safety switch requiring no replacements is fitted and the boiler can be supplied for right- or left-hand fitting.

Jackson sink-type washboiler

D

A World Clock

EVERETT EDGCUMBE & CO., LTD., Colindale Works, London, N.W.9, have introduced a synchronous clock from which can be read at a glance the time in all parts of the world.



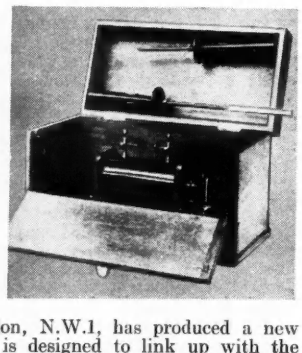
The "Synclock" world clock

The mechanism operates in the same way as an ordinary clock, but instead of driving an hour hand the dial itself is made to revolve in relation to fixed arrows, the minutes being registered by a hand in the usual way. The clock in the illustration shows the time to be 9.22 a.m. G.M.T., the hour reading in other countries being shown by the arrows. The minute reading remains the same at "22."

The motor employed in this "Synclock" is of the self-starting synchronous oil-bath type.

Testing Insulators

RUNBAKEN PRODUCTS, 13/15, Liverpool Road, Deansgate, Manchester, 3, have developed a new method of testing insulators and insulated parts so that flaws and cracks can easily be detected. The standard equipment gives a voltage of from 20 to 50,000 V, and it can be supplied to operate on AC or DC or from a battery.



The Runbaken insulator tester

A Cover for Cable Troughs

THE MARSTON VALLEY BRICK CO., LTD., Clifton House, Euston Road, London, N.W.1, has produced a new "electricity" brick, which is designed to link up with the bricks behind and in front by a special method, so that it can be laid in a circle with a two-foot radius without openings through which stones or earth can fall and damage the cable. No special ties are required, and the tiles are proof against movements of the trench or the cable. They are made to cover the same lineal footage as any other electricity tiles, and can be made in all sizes to suit the requirements of municipal authorities, the standard sizes being 9 in. by 4½ in., 9 in. by 6 in., and 12 in. by 6 in. The brick is manufactured for both high-voltage and low-voltage requirements.

Portable Magnetic Crack Detector

A low-priced portable crack detector for use with flat surfaces which has been placed on the market by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17, takes the form of a thin hollow disc-shaped container filled with the usual mixture of fine iron dust and oil and having one or both sides transparent in order that the concentration can be easily observed.

The Metro-Vick portable magnetic crack detector, showing indication of radial cracks in end of round steel bar

After the specimen has been magnetised, the detector is placed upon its surface, preferably horizontally, and gently tapped or rocked. Any surface crack, even one scarcely observable by ordinary microscopic examination, is said to be clearly indicated within 15 to 20 sec. by a black line formed of the fine iron particles, attracted to the magnetic poles created at the edges of the crack.

After the indication has been noted, shaking the detector redistributes the iron dust ready for the next application.

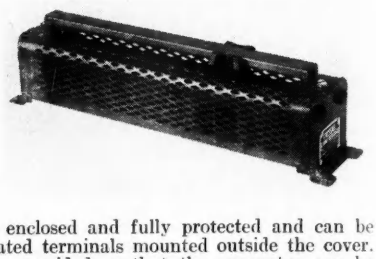
The detector is applicable both to industrial routine inspection of ferrous materials and to instructional work in colleges. Apart from the detection of flaws it can be used for the study of magnetic and metallurgical problems such as the demonstration of leakage paths in magnetic systems, the magnetic fields associated with current-carrying conductors, the effects of work-hardening of steels or for indicating the presence of electrostatic fields.

The residual flux in a magnetised specimen is usually sufficient to give clear indications but by increasing the field strength, as, for instance, by the use of magnetising coils while the test is applied, sub-surface faults can be located.

Its sensitivity to magnetic discontinuity enables it to detect invisible magnetic markings such as can be made by drawing with a magnetic point on a hardened steel surface.

Improved Sliding Resistance

To comply with the requirements of the Factories Act, 1937, the CRESSALL MANUFACTURING CO., LTD., 31, Tower Street, Birmingham, 19, has brought out an improved type of sliding resistance for the speed regulation of small motors, lamp dimming, &c.



The improved Cressall resistance

The resistance is enclosed and fully protected and can be supplied with insulated terminals mounted outside the cover. Three terminals are provided so that the apparatus can be utilised either as a potentiometer or resistance. A handshield prevents contact with the "live" slide rod through the slot in the cover.

Push-button Switches

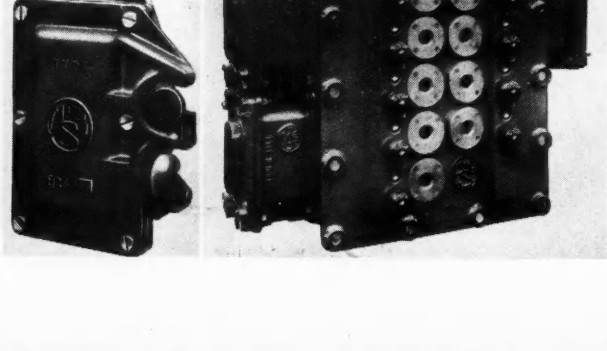
A series of new push-button switches with single and multiple units is the latest development of M. & C. SWITCHGEAR, LTD., Kelvinside Works, Kirkintilloch, Glasgow.

These switches are designed for use in connection with automatic starting and control gear, and for the remote tripping of circuit-breakers. The double-break switch has a rolling moving contact ensuring a clean surface at the position of final contact. The current-carrying parts are plated and the contacts can be arranged for opening or closing circuit as required. The switch is rated at 660 V.

A flameproof type which has a Buxton certificate can be used in garages and mines. Protection is provided against accidental operation of the starting lever and a flameproof terminal chamber is incorporated.

For use in dairies, dye-works and laundries each waterproof casing is obtainable with wide flanges between which a cork-fabric is inserted. Operation is by side levers, as in the case of the flameproof type, and entries for ¾ in. screwed conduit are standard.

M. & C. push-button switches:—Left: Hoseproof type. Centre: 18-point flameproof push-button station with indicating lamps. Right: 4-point arrangement with facilities for locking opening buttons with indicating lamps



NEW BOOKS

The National Grid. Electro-acoustics. Design of DC Machines

The Grid System. By R. Gabel. (Pp. 43; figs. 9.) London: Draughtsmen Publishing Co., Ltd. Price 2s.

THE newest of the pamphlets issued by the Association of Engineering and Shipbuilding Draughtsmen deals with the leading technical features of the grid and gives the historical background that led to its inception. As the author points out, interconnection of electric power stations is being carried out in nearly every country, examples of which he gives. Brief particulars of the earliest supply undertakings in Great Britain and notes on the main provisions and effects on development of early legislation follow.

While credit is given to Ferranti in regard to his AC high-voltage schemes at Grosvenor Gallery and later at Deptford, it is perhaps insufficiently emphasised that his transformer and also the Parsons turbine, two distinctly British developments, form the basis of present practice all over the world. In order to complete the picture, when mentioning the formation of power companies in 1900, reference might have been made to the Cross Joint Select Committee of 1898 and of the Kitson Select Committee of two years later. It would have been interesting to have had the author's views on the reasons for the ineffectiveness of the 1919 Act, which set up the Electricity Commissioners and (as is not so often remembered) empowered the Board of Trade to spend £20 million on the construction of generating stations and transmission lines. When stating the borrowing powers of the Central Electricity Board, it would have given a better idea of the position if it had been pointed out that while the Treasury was empowered under the 1926 Act to guarantee the payment of the principle and interest of any loan, no such guarantee has actually been asked for by the Board.

In addition to the considerable details presented with diagrams of grid sub-stations, transmission lines, protective gear, metering, grid tariffs and change of frequency, which occupy more than half of the book, information has been culled from various sources with maps relating to the coalfields, location of industries and rural areas and an indication of water power resources of Great Britain including maximum head and rainfall. A list is given of selected generating stations with a reference to large units; the largest turbo-alternators at Barking are, however, 75,000 kW and not 50,000 kW as stated.

While such relatively recent developments as carrier current protection are mentioned, there is no reference to the impulse-type circuit-breakers with total break times of 3 to 3.5 cycles. Although it makes little difference to the main theme, it seems a pity that statistics as to kWh generated and the thermal efficiency of power stations are taken for 1936 when the corresponding figures for 1937 have been available for several months. The concluding section seems to imply that the rapidity of recent electrical progress has been entirely due to the grid, whereas many of the developments named would have occurred without its aid.

Our criticisms relate to minor points, however, and many are no doubt occasioned by the limits of space imposed on the author. The pamphlet can be recommended to all who wish to have comprehensive information in compact form about a scheme admired by engineers the world over.—C. O. B.

Motion Picture Sound Engineering. (Pp. 547; figs. 368.) London: Chapman and Hall. Price 30s.

One of the features of the past decade has been the extraordinarily rapid development of the electro-acoustic industry. It is now evident that the development has reached a phase at which exploration has been arrested for want of fresh material, and it is therefore convenient to take advantage of the pause to collate our acquired knowledge in the form of a standard work of reference.

This has been most successfully accomplished in "Motion Picture Sound Engineering." The book is of composite authorship, each different section being written by an expert, but so well has the material been blended that no impression of separate authorship is produced when reading the book. The most remarkable feature of this volume is the lucid development of each subject; the beginner does not open the book and close it again with the remark that he "will never understand all that," nor does the expert drop the book as trivial, as however expert he may be he will still find plenty to learn. The book richly deserves success.—C. M. R. B.

Spontaneous Fluctuations in Voltage. By E. B. Moullin. (Pp. 251; figs. 110.) Oxford: Clarendon Press. Price 17s. 6d.

This is a book which is possibly only of transitory value, but certainly of great immediate interest. Some aspects of most of the phenomena dealt with, fluctuations in circuits which are mainly of atomic origin—using this term in a wide sense—have been known for many years. Recently they have acquired technical significance through the widespread use of thermionic tubes. It has been found simultaneously that some of the effects in question appear rather less simple than might have been anticipated. Mr. Moullin has done much research on the subject himself, and presents here a general account of it illustrated largely from his own experiments and those with which he has been associated, and accompanied by a very full discussion of the difficulties in interpretation which he has encountered. It is the last feature which makes the book particularly noteworthy.

The individual chapters are upon thermal fluctuation voltage, shot voltage, physics of the diode, shot voltage in space-charge limited diodes, multi-electrode tubes, flicker effect, ionisation effect and secondary emission and technical problems. An appendix contains some important matter which appeared too late for incorporation in the main text. The first two topics, the immediate consequences of the equipartition theorem and of the atomicity of electricity, are relatively simple. The later ones are more complex, either in their fundamental origin, or in consequence of the electrode or circuit arrangements. The mathematics used is inevitably considerable but not unduly difficult and is worked out fully, with a continual reference to its physical significance which is one of the attractive features of the book. It will present no difficulty to anyone with an elementary knowledge of statistical methods.

As the author emphasises, this is the story of a problem not of its complete solution, and it is difficult to see precisely how the latter will be approached. At first sight it seems that there is a sufficiency of experimental data, which should be amenable to mathematical analysis. Statistical theory seems, however, to be still insufficiently developed to deal with all aspects of the work. Sooner or later this deficiency is bound to be removed, perhaps through the development of mechanical devices of the type of the differential analyser, but meanwhile it is not improbable that the necessary clues might be furnished by additional, carefully planned experiments.—K. G. E.

Physics for Technical Students. By W. B. Anderson. (Pp. 796; figs. 534.) London: McGraw-Hill Publishing Co. Price 15s.

This book, although not of outstanding merit and somewhat uneven, deals with its subject in a lucid and interesting way. It forms a companion volume to a previous one by the same author which was reviewed recently in these columns. The dedication to technical students is somewhat misleading, since it does in fact cover the ground of the second half of an ordinary Intermediate B.Sc. course in British Universities, with an outlook in which the experimental rather than the mathematical side seems to be primarily emphasised.

Sound is dealt with in three chapters, electricity and magnetism in ten, and light in thirteen, but undue weight is not given to optics as three of the chapters under that head are actually given over to radioactivity, recent physics and radio. The author stresses the importance of acquiring a working knowledge of electrical formulæ. In Chapter XXX (on the measurement of current, &c.) he uses the *abamp* as a unit (1 *abamp* = 10 amps); this has not yet found great favour in this country.

On the whole, this is a book that can be recommended for a student in his first year at the University. It contains the facts, is well illustrated and indexed, and gives a good introduction and stimulus to more advanced work.—K. G. E.

The Performance and Design of Direct Current Machines. Second edition. By A. E. Clayton. (Pp. 445; figs. 275.) London: Sir Isaac Pitman & Sons. Price 16s.

The design of DC machines has become fairly well standardised, and the use of fans and forged steel is becoming general. Moreover, the number of DC machines in use is probably increasing, despite the standardisation of AC supply. The DC motor will retain its place wherever speed control is all important. Generators, too, are increasing rapidly in number, if not in size, as evidenced in automobile practice.

In this edition, Dr. Clayton has added much new material to the text and illustrations. It is interesting to note how details can change so much in a decade.

The book can be thoroughly recommended as among the best of its kind—there is no doubt that the second edition will maintain the position established by the first.—S. P. S.

Shorter Notices

"The Nomogram," by H. J. Allcock and J. R. Jones. Second edition. (Pp. 224; figs. 77.) London: Sir Isaac Pitman & Sons. Price 10s. 6d.—Since the first edition of this book was published in 1932 both text and examples have been revised. The principle additions deal with the theory of the circular nomogram and the transformation of the set-square-index nomogram. Further investigation has convinced the authors that the use of determinants and Cartesian co-ordinates is the only satisfactory method for the practical construction of nomograms as well as for the presentation of the underlying theory. Mr. Allcock is a member of the technical staff of Callender's Cable & Construction Co., Ltd.

"The World of Engineering," by J. L. Dixon. (Pp. 205; figs. 86.) London: John Gifford, Ltd. Price 8s. 6d. The purpose of this book is stated to be the setting forth in simple form the first principles of the various branches of the engineering profession.

Scandinavian Electrical Markets

Increased imports of Denmark and Norway

THE Scandinavian countries present a rather attractive market for electrical machinery and appliances. The demand in some countries is rising at a quicker rate than the industrial output, thus creating the need for imported supplies. Denmark and Norway increased their imports during the first three quarters of last year, while Swedish and Finnish returns for the same period showed a decline as compared with the 1937 figures. The individual markets have, however, one trait in common, *viz.*, a growing demand for generating machinery and associated merchandise such as transformers, convertors and heavy switchgear, the result of many private and public schemes to expand the electric power supply systems. With regard to Sweden and Denmark, which are the only Scandinavian countries doing export trade of any proportion in the case of electrical goods, a perceptible increase has occurred in shipments during the first three quarters of last year. The trend of foreign trade in the individual countries is illustrated by the following data.

Sweden

Swedish electrical trade statistics are divided into two groups, one according to values and the other quantities. The first group shows a turnover which is practically unchanged at a value of 30.5 million kroner, or the equivalent of roughly £1,530,000. Imports of radio sets and components as well as of accumulators were reduced, while supplies of meters and generator parts were unchanged. Imports of generators, convertors and motors (including fans, vacuum cleaners, &c.) rose at the rate of more than 15 per cent. The following table shows imports of these classes in units of one million kroner (£=19.0 kroner).

IMPORTS (GROUP I).

	Million kroner. 1937	1938
Generators, motors, convertors ...	6.9	7.4
Fans, vacuum cleaners, etc.	3.5	4.6
Stators and rotors	0.7	0.7
Accumulators	0 .8	0.6
Radio sets and components	11.7	9.7
Other special appliances	5.0	5.5
Meters and indicators	2.0	2.0
Total	30.6	30.5

The second group shows a decrease from about 11,200 to 9,800 tons, or approximately 16 per cent., the change being chiefly due to reduced imports of wire, cables and insulating materials. A substantial decrease has also taken place in regard to supplies of carbon for electrical purposes. The following quantities were imported, the unit employed being the metric ton :—

IMPORTS (GROUP II).

	Metric tons. 1937	1938
Dry cells...	578	504
Lamps	58	60
Flashlamps	328	249
Electric carbon	3,618	3,257
Switchgear, fuses	1,340	1,129
Insulating materials	633	413
Cables	3,964	3,647
Wire	780	546
Total	11,209	9,805

The exports of goods show a rising trend, *viz.*, from 30.5 to 34.7 million kroner, and from 3,276 to 3,760 tons. Conspicuous increases of exports are noticed with regard to cables, telephone and telegraph apparatus, generators, convertors, motors, fans and vacuum cleaners, but the rise is seen to have been general.

EXPORTS.

	Tons 1937	Tons 1938
Cables	2,278	2,571
Switchgear, fuses	954	953
Lamps	44	46
	Million kroner	
Generators, motors, convertors ...	11.8	12.4
Fans, vacuum cleaners...	8.8	10.2
Stators and rotors	0.6	0.5
Accumulators	1.3	1.3
Telephone and telegraph appts. ...	5.4	7.0
Radio sets and components	0.8	1.0
Other special appliances	1.8	2.3

Denmark

Denmark increased her imports of electrical goods by about 17 per cent. from a value of 14.9 to 17.4 million kroner, while exports advanced by about 13 per cent. from 8.8 to 10 million kroner. The rise in import value was chiefly due to supplies of cables and wire being increased from 400 to nearly 1,500 tons, or from 0.85 to 2.21 million kroner in respect of value. The rise in exports was chiefly ascribable to increased shipments of various electrical machinery, notably of refrigerating equipment. Some details of the trend of the trade are given following, in units of one million kroner (£=22.40 kroner) :—

IMPORTS.

	Million kroner. 1937	1938
Generators, motors, convertors ...	1.02	1.46
Accumulators	0.53	0.72
Lamps	1.76	1.70
Radio sets and components	3.16	3.28
Telephone and telegraph equipment ...	0.97	0.72
Cables and wire	0.85	2.21
Household appliances	0.24	0.37
Other electrical apparatus	4.04	4.39
Wiring equipment, &c.	2.32	2.57
EXPORTS.		
Dynamos and motors	2.18	2.03
Insulators, wiring equipment	1.41	1.22
Refrigerators, electrical machinery ...	5.25	6.73

Norway

The total value of Norway's imports of electrical machinery, accessories and appliances rose from 25 to 26 million kroner, due chiefly to increased imports of generators, cables, wire and heavy switchgear. The trade is divided into two statistical categories, one according to value and the other quantity. The first category shows a rise in value from 9.7 to 10.9 million kroner (£=19.50 kroner), comprising the following goods :—

IMPORTS (GROUP I).

	Million kroner. 1937	1938
Generators	0.8	2.0
Motors	2.9	2.8
Heavy switchgear	0.9	1.4
Transformers	0.5	0.7
Radio receivers	2.4	2.1
Radio components	1.7	1.5
Household switchgear	0.5	0.3

The second category saw an advance in respect of quantity from 3,002 tons to 3,356 tons. This group comprised :—

IMPORTS (GROUP II).

	Tons 1937	Tons 1938
Cables and wire...	1,525	1,965
Dry cells...	333	378
Accumulators	484	458
Lamps	74	62
Radio transmitter equipment... ...	176	138
Irons, heaters, &c.	190	184
Lamp sockets	220	171

Finland

Finland has increased her supplies of bulbs, batteries, radio sets and valves, but total imports decreased from some 200 to 191 million marks (£=226.80 Fmk). The trade trend is revealed by the following table of import values :—

	Million Fmk. 1937	1938
Electrical machinery	105.8	86.7
Accumulators	6.0	6.5
Dry cells...	8.6	10.5
Cables and wire...	34.6	33.8
Bulbs	2.9	6.4
Radio receivers and components ...	38.1	42.1
Radio valves	5.3	5 6

Gravesend Electrical Exhibition

OF 16,500 premises in the area of Gravesend Corporation electricity undertaking 14,500 are connected to the mains, said Alderman J. W. Clunn, chairman of the Electricity Committee, at the opening on February 27th of the Corporation's Electrical Exhibition at the Co-operative Hall.

The Mayor (Councillor Walter C. Fletcher), who performed the opening ceremony, said that when the undertaking started thirty-seven years ago its output was 600 kW from plant costing £35,000. To-day it produced 13,000 kW, and the total expenditure had approached £750,000. Although the charges were among the cheapest in the country, they were able to meet not only the sinking fund charges on the debt and all the cost of working, but had a surplus of £5,000 per year for the relief of rates. Gravesend was still able to produce electricity at considerably below grid charges. Speaking of the pending retirement of Mr. C. F. McInnes, borough electrical engineer, he said that it must be a great satisfaction to him to know that he would leave an undertaking which had developed on sound financial lines.

The Mayor was presented with an electrical safety razor and the Mayoress with an electric iron by Alderman Clunn.

The Exhibition comprises displays of sound films, practical cooking lectures by Miss Weedon (Jackson Electric Stove Co., Ltd.), and demonstrations of "Sadia" water heaters. Electric refrigerators are also prominently featured. The Gravesend branch of the Electrical Contractors Association has an attractive stand, displaying portable domestic appliances, fires, lighting fittings, &c.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

THE E.D.A. council has decided to utilise the interest on a legacy left to the Association by the late Mr. Emile Garcke a few years ago to present a prize of £5 to the student in the E.D.A. salesmanship training course securing the highest marks in the final examination. In 1938 **Mr. J. R. E. G. Allen** (Central London Electricity, Ltd.) and **Miss P. Gidley** (Grimsby) tied for top place, and in view of the far larger number of students who took the examination in 1938 than is anticipated for any future year, the council has decided to award two Garcke prizes of £5 each for 1938 to the above students. The Association has granted five further E.D.A. sales engineers' diplomas, and thirty-three E.D.A. domestic electrical salesmanship diplomas.

Mr. P. V. Hunter

Mr. P. V. Hunter, C.B.E., M.I.E.E., director, joint manager, and chief engineer of Callender's Cable & Construction Co., Ltd., is designated to succeed Mr. E. E. Sharp as president of the Electrical Industries Benevolent Association at the annual general meeting of the Association to be held at the Savoy Hotel on April 21st, to which meeting all Association members are invited. Dr. A. P. M. Fleming, C.B.E., D.Eng., M.Sc., M.I.E.E., is to be the guest of honour at the annual luncheon which follows this meeting, and tickets (10s. each) can be obtained from the secretary, 6, Southampton Place, Holborn, W.C.1.

The annual conversazione and dance of the Hampshire Sub-Centre of the Institution of Electrical Engineers was held at the South Western Hotel, Southampton, on February 23rd. About 230 members and friends were received by the chairman, **Mr. W. S. Lonsdale** (chairman), and Mrs. Lonsdale, and Mr. J. M. Kennedy, O.B.E., vice-president of the Institution, the president Dr. A. P. M. Fleming, C.B.E., M.Sc., being unable to attend. Among those guests who accepted invitations were the Mayor of Southampton (Councillor A. H. Powdrill) and the Mayoress, Councillor C. W. Herniman (chairman, Chichester Corporation Electricity Committee), Messrs. W. Craven-Ellis, M.P., M. G. J. McHaffie, M.I.C.E. (chairman, Institution of Civil Engineers, Portsmouth, Southampton and District Association), J. T. H. Legge (area manager for South-West England and South Wales, Central Electricity Board), H. H. Vickers, M.A. (principal, University College) and L. B. Benny, M.A. (principal, Portsmouth Municipal College). Dancing took place from 8 p.m. to 1 a.m., with an interval for supper. The sub-committee responsible for the arrangements consisted of the chairman, Messrs. R. E. C. Horley and J. R. Harding, and Mr. A. G. Hiscock, the hon. secretary, and thanks are due to them for an enjoyable evening.

Mr. D. Cannon Brookes, manager of the Aluminium Information Bureau, Bush House, has left to take up a position with Aluminium Union, Ltd. Mr. Cannon Brookes has been manager of the Bureau since its inception in 1937. It is conducted by the Northern Aluminium Co., Ltd., in whose sales department he has held a number of executive positions during the past seven years. The new manager of the Bureau will be **Mr. E. D. Iliff,** B.Sc.(Eng.), who has been technical sales adviser to the Birmingham works of the Northern Aluminium Co. He will take up his duties at Bush House on March 6th.

Mr. A. V. Burnett, whose appointment as contract manager to W. T. Henley's Telegraph Works Co., Ltd., was announced in our last issue, has also been appointed manager of the Holborn Construction Co. as from February 1st.

Alderman J. Chuter Ede, M.P., chairman of the London and Home Counties Joint Electricity Authority, has been elected first honorary freeman of the borough of Epsom and Ewell.

Mr. E. Martin, who was recently appointed contracts manager of the Britannic Electric Cable & Construction Co., Ltd., has now been appointed general manager.

An interesting ceremony took place at the Northern Counties Orphanage on February 24th when a cheque for 400 guineas to endow a cot in the girls' house was presented by Mr. H. Sherlock, chairman of the "Nesco" Dance Committee. The gift represents the accumulated surplus of the Dance Committee and is in memory of the late Mr. J. S. Watson, a former official of the North-Eastern Electric Supply Co., Ltd., and formerly chairman of the Dance Committee.

Sir Cyril Hurcomb, chairman of the Electricity Commission, has been elected a Companion of the Institution of Electrical Engineers.

The newly formed Devon and Cornwall Sub-Centre of the Institution of Electrical Engineers held its first dinner and dance at Plymouth under the chairmanship of **Mr. H. Midgley,** city electrical engineer, Plymouth. Our picture shows a group taken at the function.

A group at the dinner and dance of the Devon and Cornwall Sub-Centre of the I.E.E., which includes (extreme left) Mr. H. Midgley (chairman of the Sub-Centre) and Dr. A. P. M. Fleming (president of the I.E.E.)

C. A. Parsons & Co., Ltd., Heaton, Newcastle-on-Tyne, who this year celebrate their fiftieth birthday, marked the occasion last week with a dinner of the Foremen and Officials' Social Club. **Mr. F. G. H. Bedford,** managing director, outlined the company's history. In the early years every penny of profit was used for further development, he said. In 1918 the late Sir Charles Parsons gave his employees a holding in the company and before he died he set aside more than a third of his holding for those who worked for him. Messrs. Parsons' works now cover eighteen acres as compared with two when the works started.

At the recent annual dinner of the Ashton-under-Lyne Electricity Department Social Club, **Mr. P. Bregazzi,** borough electrical engineer, ridiculed stories that the Department was financially unsound. So far from that being the case, he said, it had a reserve fund of £35,000. They were passing through difficult times and certain trading losses had been incurred during the past year or two, but these were largely due to causes over which the management of the undertaking had no control, such as increased rates, higher cost of coal, &c. To meet these increased costs it was necessary to make slight increases in tariffs.

The Henletel Art Exhibition (W. T. Henley's Telegraph Works Co., Ltd.), held on February 23rd and 24th, maintained

At the inauguration of the new works of Brook Motors, Ltd. Left to right, standing: Messrs. A. Stocks, F. V. Brook and John L. Brook (directors), Ald. F. Lawton (Mayor of Huddersfield), Mr. R. Johnson (contractor), and Mr. N. Heppenstall (architect). Seated: Mr. Joseph L. Brook (director and manager), Mr. E. Brook (chairman and managing director), and Mr. W. Mills (secretary and director)

the high standard set up in previous years. Over 40 exhibitors were responsible for the 150 or more items in the various classes which included oil and water colours, black-and-white sketches, poster advertising for the company's horticultural show, photography, model making and embroidery. Dr. P. Dunsheath, who had several brilliant entries in the photographic section, received one of the special prizes presented by Sir Montague Hughman (chairman of the company) for an excellent alpine picture entitled " Savoie Sunshine," the other going to Miss Champness for a dainty embroidery exhibit. The Social Club's special prize was awarded to Mr. S. Butler for a well-executed model of H.M.S. *Victory*.

On Friday last the London School of Electrical Domestic Science held its annual supper dance at the Prince's Restaurant, Piccadilly. The large number of past and present students who had persuaded their escorts to join them in the fun of the evening testified to the popularity of this function. **Miss H. M. M. Minoprio,** the Principal, was a charming hostess and in pleasant company time speeded to the close in the early hours of the morning.

Mr. R. Dean, deputy electrical engineer to Coventry Corporation, has been recommended by the Luton Corporation Electricity and Transport Committee for the appointment of electrical engineer and manager of the Luton electricity undertaking.

The " English Electric " Social and Athletic Association, of Stafford, recently held its annual carnival, which extended over thirteen nights. Each evening the hall was filled to capacity, and it is estimated that over 6,000 employees and their friends were entertained. There was dancing from 8 p.m. until midnight, and during the early part of each evening there was a whist drive for which prizes were given. On February 22nd Mr. G. H. Nelson (chairman and managing director) attended, while other members of the management who were present included Messrs. J. Rogers (general manager of works), C. Hollander (commercial manager), A. D. Sloan (chief engineer), Mr. L. J. Sarjeant (manager, Bradford), and Mrs. Sarjeant, R. H. Green (general manager, Rugby), E. B. Banks (acting general manager, Preston), and A. G. Brown (chief accountant).

Mr. T. J. Hudson, manager of the Brighton Branch of W. T. Henley's Telegraph Works Co., Ltd., since its opening in November, 1931, retired on February 28th. His successor will be **Mr. W. G. Turner,** whose appointment dates from March 1st. Mr. Hudson started his business career in 1884 with the India Rubber, Gutta Percha & Telegraph Works Co., Ltd. (the Silvertown Co.), and he recalls that one of his first jobs was to operate the A.B.C. Wheatstone telegraph instrument between Silvertown and London. Later he was transferred to the Electrical Department of the Silvertown Co., where he came in contact with the late Mr. W. J. Potter, who introduced him to Henley's. Mr. Hudson entered Henley's service as an outside representative on June 1st, 1903, and became responsible for the South Coast and West of England area. His services are being retained in a part-time capacity.

Directors and executives of the Western Electric Co., Ltd., attended a dinner at the Savoy Hotel, London, on February 28th, given by P. L. Palmerton in honour of **Mr. T. Kennedy Stevenson,** president of Electrical Research Products, Inc., and **Mr. J. C. R. Palmer,** contract counsel, who have just returned from a short visit to the Société de Materiel Acoustique, the Western Electric Co.'s distributors in Paris. During his stay in England Mr. Stevenson also visited the leading British Studios and Western Electric's new plant at Cricklewood.

The annual dinner for employees of Stamford Electrical, Ltd., was held at the Stamford Hotel, Stamford, on February 25th, **Mr. C. F. Collins,** chairman of Collins Electrical, London, of which Stamford Electrical is a subsidiary company, presiding. Replying to the toast " The firm and the chairman," submitted by Mr. W. F. Billett, general manager of Collins Electrical, the chairman remarked on the effect of the crisis on trade, and said that he was pleased to say that the orders were now increasing. They had been able to give the employees a real holiday at Christmas, and hoped to be able to continue the scheme. Although their turnover was 25 per cent. less than it should be, they were holding their own, which was more than some companies could say.

That the ingenuity of electrical engineers had resulted in the lengthening of the working life of employees in the tinplate trade was the claim made by Councillor G. Edwards, Deputy Mayor of Swansea, at the recent annual dinner of the West Wales (Swansea) Sub-Centre of the Institution of Electrical Engineers. He was proposing the toast of the Institution and said there was a time when the workers in the annealing departments of tinplate concerns became too old at forty-five but since the introduction of electrical appliances their span of activity had been increased by twenty years. **Mr. H. S. Ellis,** chairman of the Western Centre of the Institute and Chief Engineer of the West Gloucestershire Power Co., said there were women employed in tinplate manufacture who were called upon to do a great deal of arduous labour for which they were not fitted.

The annual reunion dinner of No. 5 Company, London Electrical Engineers, will be held on March 18th. Particulars can be obtained from Mr. G. Pressey, 34, Osterley Avenue, Osterley, Middlesex.

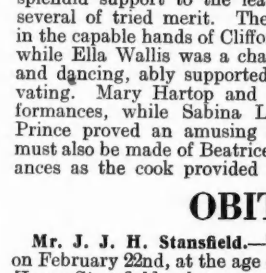
Mr. D. J. W. Harvey, A.M.I.E.E., sub-station superintendent with the Sunderland Corporation electricity supply undertaking, has been appointed mains superintendent with Kirkcaldy Corporation Electricity Department.

The impending retirement on reaching the age limit of **Mr. D. McKillop,** chief telegraph superintendent, Head Post Office, Glasgow, is announced. Mr. McKillop entered the P.O. service forty-six years ago as a boy messenger, and passed through all grades, being appointed chief telegraph superintendent in 1936.

The Clesco Light Operatic & Dramatic Club (County of London Electric Supply Co., Ltd.), added one more to its long list of successful musical productions when it presented " No! No! Nanette " at the Fortune Theatre, Drury Lane, London, W.C., on February 23rd, 24th and 25th. This popular musical comedy can only be safely attempted by a dramatic society of all-round strength, and the Club's presentation was ample evidence of this quality. The ladies and gentlemen of the chorus, so important to a production of this type, gave splendid support to the leading players, among whom were several of tried merit. The comedy element was principally in the capable hands of Clifford Thatcher and Lawrence Adams, while Ella Wallis was a charming " Nanette " whose singing and dancing, ably supported by Frederick Green, were captivating. Mary Hartop and Erica Corkett gave polished performances, while Sabina Lyon, Peggy Sharpe and Gladys Prince proved an amusing trio of " golddiggers." Mention must also be made of Beatrice Shaw, whose all-too-brief appearances as the cook provided some broad humour.

OBITUARY

Mr. J. J. H. Stansfield.—The death occurred at Southport on February 22nd, at the age of sixty-seven, of Mr. Joseph John Henry Stansfield, who was a well-known figure in the business life of Yorkshire. Mr. Stansfield was secretary of the Yorkshire Electric Power Co. from the commencement of its operations in 1903 to his retirement from active business life in 1938. In addition he was secretary of Electrical Distribution of Yorkshire, Ltd., and a director of the Mid-Cumberland Electricity Co., Ltd., the Penrith Electric Supply Co., Ltd., the North Lincolnshire & Howdenshire Electricity Co., Ltd., and Electricity House, Ltd. He was a fellow of the Chartered Institute of Secretaries and a vice-president and past chairman of the West Yorkshire Branch and a fellow of the Institute of Cost and Works Accountants. He was also, until his resignation last year, chairman of the Secretaries Committee of the Incorporated Association of Electric Power Companies. He leaves a widow and one daughter.



Mr. J. J. H. Stansfield

The funeral took place at Southport Cemetery on February 25th. In addition to the chief mourners a large number of former colleagues and associates attended. These included Mr. J. W. Chant, secretary (representing Yorkshire Electric Power Co. and Mr. Geoffrey Ellis, chairman, and the directors), Col. H. C. Fraser (representing Mr. W. B. Woodhouse, managing director), Mr. G. Ezard, Mr. J. W. Willison (also representing Mr. P. Furness, Electricity Commission of South Africa), Mr. Alfred Ingham (representing Mr. O. Errington Wilson and Messrs. Barr Nelson and Co., Leeds), Mr. A. Clegg (representing the Chartered Institute of Secretaries), Mr. Ed. J. Lollar, of the Mersey Power Co., Ltd. (also representing Incorporated Association of Electric Power Companies), and Mr. S. M. Rix, secretary of the Lancashire Electric Power Co.

Mr. W. E. Maddams.—It is with regret that we record the death on February 21st of Mr. William Edward Maddams, manager of the Government & Railway Department of the General Electric Co., Ltd., which company he joined in 1899. During his forty years' service he acquired a wealth of electrical experience and a wide circle of friends in the industry, by whom he will be greatly missed. He was fifty-five years of age, and is survived by his wife and one son.

Mr. W. E. Maddams

Mr. H. Rotherham. — We regret to learn of the death of Mr. Hugh Rotherham, senior member of Rotherham & Sons, Ltd., Coventry.

Professor Henry Louis, who has died at Newcastle-on-Tyne, aged eighty-three, was a well-known mining engineer and is believed to have been the first man to use the telephone for communication between the surface and underground workings in the mine. He carried out experiments with the telephone with Bell while in Nova Scotia.

COMMERCIAL AND INDUSTRIAL NEWS

A.R.P. Demonstration at the M.E.M. Works. New Electrical Showrooms. Modern Office Lighting. A Theatre for Lighting Demonstrations.

Lighting Conference for Architects

THE fourth and last session of the 1939 architects' conferences on electric lighting was held at the E.L.M.A. Lighting Service Bureau on February 22nd and proved not only the best attended (275) but by far the most provocative of discussion. The subject "Lighting Problems in Domestic Architecture" was opened by Mr. H. Lingard, after which there was a discussion lasting for over an hour. At the conclusion of the conference a visit was paid to the new Adelphi building to inspect the lighting.

World Refrigerator Sales

World sales of household electric refrigerators by manufacturers to distributors and dealers in December last amounted to 54,363 units, according to the *Electrical World*, as compared with 113,132 in December, 1937, and for the entire year the sales were 1,358,956 units, as compared with 2,394,659 for 1937. American sales for the twelve months totalled 1,191,627, as against 2,203,335 for 1937.

N.E.S.C.O.E. Dinner

The North-Eastern Electric Supply Co. Old Employees' Association will hold its annual dinner at the County Hotel, Newcastle-upon-Tyne, on March 24th. Mr. R. P. Sloan (president) will be in the chair and the guest of honour will be Lt.-Col. S. E. Monkhouse. Serving members of the staff of the North-Eastern Electric Supply Co. will be welcomed. Tickets (8s. each) can be obtained from Mr. W. A. Hall, room 201, Carliol House, Newcastle-on-Tyne, and members are asked to submit the names of any of their own guests to Mr. W. G. Bass, hon. secretary, 506, Bush House, London, W.C.2.

An A.R.P. Demonstration in Birmingham

The Midland Electric Manufacturing Co., Ltd., gave an A.R.P. demonstration at its works at Tyseley, Birmingham, on February 25th, the object being to test the company's self-contained A.R.P. organisation. The demonstration lasted about two hours, every section of A.R.P. from evacuation to wreckage clearance and decontamination being brought into operation. There were reproduced conditions under which emergency work would probably have to be carried out during an air attack. The demonstration opened with the sounding of the air raid alarm, which was followed by the evacuation of the works, while members of the various squads took up their working positions. This was completed in less than six minutes and by this time every one was under cover in the 552 ft. of shelters situated on the waste ground adjacent to the company's sports field. Loudspeakers amplified the noise of the aeroplanes, and with a roar a buried bomb threw up a pile of earth. A water pipe burst; an incendiary bomb on the roof of a wooden shed hissed and flamed; and the air vibrated with the sound of explosions. The fire was effectively tackled with hose pipes by men wearing gas helmets. The various

Employees taking cover during an A.R.P. demonstration at the M.E.M. works

squads did their work efficiently. About 130 employees took part in the exercises. As soon as the whole area was reported safe the employees were allowed to leave the shelters. This completed the outdoor exercises. The spectators were then asked to proceed to the canteen, which for the purpose of the demonstration had been converted into a first-aid and cleansing post. Here the casualties received emergency first-aid and cleansing treatment before being removed to the base hospitals. The station was then converted into a cleansing post for working parties, and members of squads who required cleansing treatment were dealt with. The exercise was witnessed by factory A.R.P. officials from all parts of the United Kingdom, the assistant co-ordinating officer for the City of Birmingham, and a group of thirty instructors belonging to the City of Birmingham A.R.P. Instructors' Association. At the close of the demonstration A.R.P. badges were presented by Sir C. Herbert Smith (chairman of the company) to the ninety-four members of the A.R.P. organisation who have completed their training.

New Electrical Showrooms

On February 22nd, Young & Wildsmith, Ltd., opened new showrooms at 9, Gun Street, Reading, in which are displayed

A corner of the new Reading showrooms of Young & Wildsmith, Ltd.

a wide range of electric lighting fittings, fires, cookers, wash boilers, and other domestic electrical appliances. These showrooms are the first of their kind in the district, being available to architects, consultants, contractors, and retailers only, or to the general public by their introductions. Now that their showrooms are completed the company anticipates shortly opening further sections for industrial and commercial fittings and apparatus.

Cooking Demonstrations at Willesden

The E.D.A. film, "News by Wire," was a feature of the cooking demonstrations held in Memorial Hall, Harlesden, from February 9th to 11th, by the Willesden Corporation Electricity Department, in collaboration with the General Electric Co., Ltd. This film, together with one starring Will Hay and his scholars, started the programme. Then followed a duologue between a new-style housewife using a G.E.C. cooker in an all-electric kitchen and a housewife cooking by old-fashioned methods and getting poor results, the latter being converted to electric cooking. After the actual demonstration, free gifts were given to lucky card holders and tea was provided for everybody. Two demonstrations were given daily, and the hall, which holds about 400, was filled each time.

The Leicester and Warwickshire Electrical Circle

The annual dinner of the Leicestershire and Warwickshire Area Electrical Development Circle will be held on March 30th at the George Hotel, Hinckley. The dinner is open to all members of the trade and further particulars can be obtained from Mr. R. B. Giles, hon. secretary, Upper Bond Street, Hinckley.

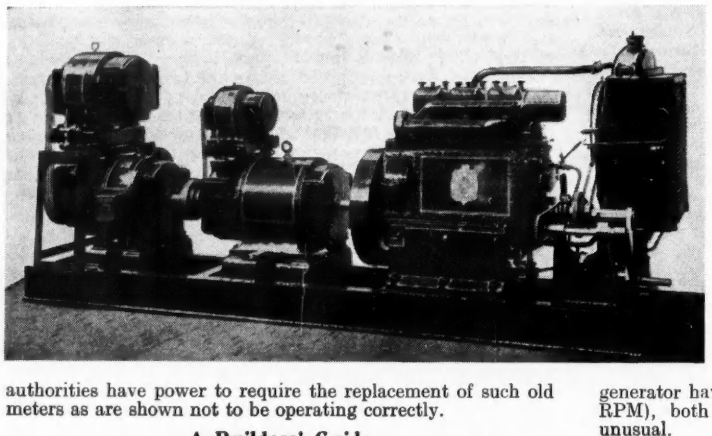
Works Visit

On February 14th members of the Illuminating Engineering Society, numbering about 100, visited the Rugby works of the British Thomson-Houston Co., Ltd. On arrival they were welcomed by Mr. H. A. Lingard (director, B.T.H. Co.) and after a short tour of the lamp works they were entertained to luncheon at which Mr. H. N. Sporborg (director) presided. Other B.T.H. directors present were Messrs. F. Fraser, J. L. Wilson, G. M. Campbell, F. Samuelson and H. Warren, and with them, representing the visitors, were Mr. P. Good (president), Dr. J. W. T. Walsh, Mr. A. Cunnington, and Mr. A. W. Beuttell (past presidents) and Mr. J. S. Dow (hon. secretary). After lunch the party went to the acoustical theatre where Mr. Warren gave a lecture on "Research on

the Production and Utilisation of Light." The rest of the afternoon was spent in the research laboratories.

Electricity Meters in Belgium

Under a recently introduced regulation only electricity meters of an officially approved type may now be used in new low-voltage electrical installations in Belgium. For the time being the new regulation is not being enforced as regards prepayment, multiple-tariff and other special meters, moreover it does not apply to meters already installed, although local authorities have power to require the replacement of such old meters as are shown not to be operating correctly.



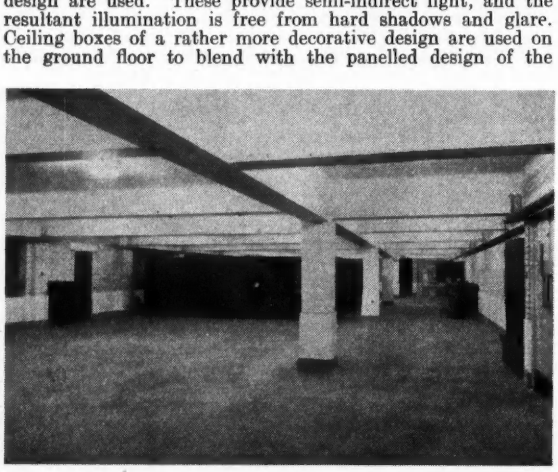
A 30-BHP Ruston Diesel engine driving a Crompton 10-kW alternator and generator for the North-Western Railway, India

A Builders' Guide

The 1939 edition of Laxton's Builders' Price Book has just been published by Kelly's Directories, Ltd., at 10s. 6d., net, post free. This publication enables comparison to be made between alternative materials and methods of construction. By means of the various analyses and other data the prices can be adjusted to suit varying localities and conditions. A new feature of this edition is an A.R.P. section which gives prices for temporary, semi-permanent and permanent shelters of various types, together with descriptions and prices of fire-resisting and fire-proofing materials, gas and splinter-resisting windows, shutters and doors, gas filtration and ventilation plants and sundry fittings. The timber marks section has again been revised to give up-to-date and helpful information on this subject. The book is divided into trade sections covering all branches, and all items are listed in a very full index. The tables and memoranda section gives the weights of many building materials and other useful data and mathematical tables. The chapter entitled Legal Notes and Memoranda has been thoroughly revised and brought up to date in conformity with the latest decisions in the Courts. The list of proprietary articles and trade names has been revised and extended for this edition. The tables showing the standard rates of wages for the building trades in nearly 750 towns and districts of England and Wales include many regradings which came into force on February 1st, 1939.

An Office Lighting Installation

An interesting modern lighting installation is that for an extension to the offices of Cerebos, Ltd., Willesden. This new block comprises two office floors and a basement, and while each floor has been treated differently the lighting throughout is exceptionally even and well diffused, and in no case is any bright source of light apparent. In the basement, owing to the low ceiling height, circular ceiling boxes of a very clean design are used. These provide semi-indirect light, and the resultant illumination is free from hard shadows and glare. Ceiling boxes of a rather more decorative design are used on the ground floor to blend with the panelled design of the ceiling. Each fitting, which is 26 in. by 19 in., contains one lamp, and here again the absence of harsh shadows or glare is evident. On the upper floor efficient indirect pendants have been used. For the kitchens, cloakrooms, &c., there are similar fittings to those in the basement, while in the corridors the more decorative ceiling boxes are installed. The whole installation was planned and supplied by G. V. D. Illuminators, Ltd., in collaboration with the architect, Mr. R. W. Radburn.



The basement of the office extension of Cerebos, Ltd.

Portable Generating Sets for India

The North-Western Railway, India, has ordered two generating sets installed in rail coaches for use where a temporary supply is required. As a portable power station this plant can supply DC two- or three-wire systems, and AC, three-phase, four-wire systems.

The sets are driven by Ruston & Hornsby Diesel engines. One set consists of a Ruston 80 BHP four-cylinder Diesel engine driving a Crompton Parkinson screen protected, revolving armature alternator (25 kW, 0.8 PF, 420/240 V, 50 cycles, 750 RPM) and a C.P. screen protected, level compound wound DC generator with split series winding (25 kW, 480/240 V, 750 RPM) with protected short circuiting switch and static balancer for 25 per cent. out-of-balance current. The two machines are coupled together and arranged for flexible coupling to the engine. An exciter is provided for the alternator and also a battery charging generator having an output of 8.25 kW, 150 A, 30/55 V, 1,500 RPM), both vee-belt driven, this arrangement being rather unusual.

The other generating set is similar, the engine in this case, however, being a Ruston 30-BHP, three-cylinder Diesel, the alternator 10 kW, 1,000 RPM, and the DC generator 10 kW, 480/240 V, 1,000 RPM.

New Domestic Apparatus Showrooms

With the recent transfer of its showrooms from Newman Street to 21, Vardell Street, Hampstead Road, N.W.1, Galsworthy, Ltd., not only have much more convenient and better equipped display accommodation at their disposal but are now in a position to give more rapid and more complete service, since all the manufacturing, designing, technical and showroom staff are concentrated under one roof. The premises are only two or three minutes' walk from the top of Tottenham Court Road.

[Elec. Rev. photo.

A corner of the new showrooms of Galsworthy, Ltd.

The entrance hall of the building, which incidentally was once a County Court, has been set aside specially for the display of Adams and Louis lighting fittings, other period units, such as Georgian, Queen Anne, Sheraton, Dutch and Elizabethan, being found in a large room on the left. On the other side of the hall is a section devoted to modern and semi-modern fittings, an alcove containing examples of panel glass and crystal glass pendants. From here a service lift gives direct communication with the stores. Wood and iron fittings, some of the latter being available in attractive sprayed colours, can be seen in a separate department at the rear and leading from this is a further section containing, besides bathroom fittings and various discontinued lines offered at bargain prices, a selection of domestic appliances such as cookers, fires, toasters, kettles, clocks, irons, &c.

With the exception of the wood units all the lighting fittings are designed and manufactured on the premises. To make room for the new showrooms it has been necessary to reorganise the factory arrangements and a new section has been added at the rear. The company prides itself on its finishes and does all its own silver- and copper-plating as well as hand lacquering.

Ipswich and District Electrical Association

The annual dinner of the Ipswich and District Electrical Association will be held at the Felix Hotel, Felixstowe, on March 17th. Tickets (8s. 6d. each) can be obtained from Mr. W. H. Howell, hon. secretary, Electric House, Lloyds Avenue, Ipswich.

A Modern Cleansing Depot

In our article on the Westminster cleansing depôt in our last issue we referred to a "Crypton" face and hand dryer in the employees' washhouse. This is a Crypto electric face and hand dryer and it was made by the Lancashire Dynamo & Crypto, Ltd., at its Willesden works.

New Reading Trolley-buses

With regard to the description of the new trolley-buses for the Reading Corporation published in our February 17th issue, we are asked to state that these vehicles are the joint production of the Associated Equipment Co., Ltd., and the English Electric Co., Ltd.

Colour Corrected Lighting

An exhibit which has been attracting particular interest at the Castle Bromwich Section of the British Industries Fair is that arranged by Rowlands Electrical Accesories, Ltd., to demonstrate the "R.E.A.L. Balanced Light" principle. In one portion of this display, which incidentally is without doubt the largest single lighting exhibit ever shown at the Fair, pairs of identical shop windows enable visitors to appreciate the merits of the company's "Commercial," "High Mix" and "Super Mix" colour-corrected mercury lighting, when compared with ordinary gas-filled lamps of similar wattage in identical fittings. In the case of the "Super Mix" units an approximation to within 98 per cent. of daylight is claimed. The "High Mix" and "Commercial" fittings, while not giving such a high degree of correction, are, however, in certain cases, more effective than the "Super Mix," the "Commercial," for instance, being especially suitable for the display of glassware.

Two displays emphasise the advantages of colour-corrected mercury lighting for colour matching. One takes the form of a fashion display showing how various fabrics respond to

The stand of Rowlands Electrical Accessories, Ltd., at the B.I.F., Birmingham

illumination under "R.E.A.L. Balanced Lighting" and also under gas-filled lamps of similar wattage. In the other exhibit various coloured articles can be viewed under ordinary gas-filled, sodium, raw mercury and colour-corrected mercury lamps.

As an indication of the minimum lighting intensities recommended for different localities and also of their running costs, another window shows the results obtained with R.E.A.L. fittings giving 100 W per ft. (for central shopping areas), 66 W per ft. (for main streets outside the central shopping area) and 33 W per ft. (for side streets). Among the comprehensive range of fittings for all purposes shown on a separate stand is a special range of A.R.P. units.

Lighting Demonstration Theatre

The new lighting demonstration theatre of Strand Electric & Engineering Co., Ltd., at 29, King Street, W.C.2, was opened last week with an hour's programme of varied lighting effects.

This complete theatre in miniature has a seating capacity of ninety in properly raked stalls and a small circle and, apart from a complicated system of stage and effect lighting, the auditorium has a complete colour-lighting system with 34 dimmers, the latter being used for stage lighting when the auditorium lights are off. The stage has been equipped with a complete set of curtains, unit scenery and a curved cyclorama measuring 27 ft. by 20 ft. Of special interest is the light console, designed by Mr. F. Bentham, which enables one operator to control from his seat the same amount of apparatus as a switchboard 15 ft. by 8 ft., which would probably need two operators. The console is not entirely new but has undergone a number of improvements. A later introduction is the luminous control panel measuring only 2 ft. by 1 ft. 6 in. by

The new Strand Electric lighting demonstration theatre

4 in., and yet able to operate 90 lighting circuits with dimmers and twelve scene presets and "black out." It enables the electrician to sit in the stalls during rehearsals with the panel on his knee, and during the performance it can be operated on the stage.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price March 1st.	Fortnight's inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£37	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax... ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 8s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4¼d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£197	£2 dec.
Grade II ... ... ,,	£137	£1 dec.
Grade III ... ... ,,	£73	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	11¼d. to 11¾d.	—
c ,, Wire, basis ... ... ,,	8⅜d.	¼d. dec.
c Copper Tubes (solid drawn) ... ,,	1/0¾d.	—
g ,, Bars (best selected) ... per ton	£78	—
g ,, Sheet... ... ... ,,		—
g ,, Rod ... ... ,,		—
d ,, (Electrolytic) Bars ... ... ,,	£48 5s.	—
d ,, ,, Wire Rods ... ,,	£53	—
d ,, ,, H.C. Wire ... per lb.	7 1/16d.	—
f Ebonite Rod ⅛" dia. & up.... ... ,,	1/10 to 2/5	—
f ,, Sheet ..." thick & up ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	Nom.	—
h India-rubber, Para-fine ... ... ,,	7½d.	½d. inc.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 15s.	—
i ,, Wire galv. No. 1 P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£16 5s.	—
g Mercury ... ... per bot.	£16 8s.	—
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/1d.	—
p ,, ,, rolled strip & sheet ,,	11½d.	—
p ,, ,, wire ... ... ,,	1/1½d.	½d. dec.
o Platinum ... ... per oz.	£7 10s.	—
d Silicum Bronze Wire ... ... per lb.	8 11/16d.	—
g Spelter ... ... per ton	£13 10s.	—
g Tin, Block (English) ... ... ,,	£213 15s.	10s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/6	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

New Catalogues and Lists

Lancashire Dynamo & Crypto, Ltd., 94, Petty France, Westminster, London, S.W.1.—A new brochure known as the "L.D.C. News" reviewing installations and new technical developments.

Mayfair Shades, Ltd., 90-96, City Road, London, E.C.1.—A 32-page illustrated art catalogue of lighting fittings and shades.

Davidson & Co., Ltd., Sirocco Engineering Works, Belfast, Northern Ireland.—A booklet (p. 34) dealing with "Sirocco" equipment in the brewing industry, and booklet SF.289 which deals with the section of the new Factories Act relating to temperature, ventilation and dust or fume removal.

H.M.V. Household Appliances, Ltd., 104, New Bond Street, London, W.1.—A leaflet describing the 1939 H.M.V. refrigerators.

Fredk. Braby & Co., Ltd., Petershill Road, Glasgow, N.—A comprehensive catalogue of steel air-raid shelters, including air-purifying plant.

A. J. Coleman & Co., Ltd., 37-44, The Arcade, Northampton.—An 81-page comprehensive illustrated catalogue of all kinds of electrical appliances.

Private Arrangements

John Collier & Co. (Electrical Engineers), Ltd., 58, Stockport Road, Manchester.—A further meeting of the creditors was held on February 22nd when Mr. J. Collier occupied the chair. At a previous meeting a statement of affairs was submitted showing liabilities totalling £35,018, with net assets of £9,814, leaving a deficiency of £25,204. The matter was adjourned as it was thought that an offer of composition could be submitted. Mr. Collier stated that he was in a position to make an offer of 4s. in the £, payable as to 2s. in one month, 1s. in three months and 1s. in six months, but that offer was refused. After discussing the position the creditors decided that they should accept 5s. in the £, and Mr. Collier indicated that he thought it would be possible to provide the increase. A resolution was passed agreeing to accept a composition of 5s. in the £, payable upon terms to the satisfaction of a committee of inspection.

Mrs. J. L. Gould and **C. G. Gould,** trading as J. & H. Gould, 77, Cleveland Road, Bournemouth, electrical contractors.—At a recent meeting of the creditors of the above a statement of affairs was submitted showing liabilities of £1,660. The net assets were £409, leaving a deficiency of £1,251. It was decided that the debtors should execute a deed of assignment in favour of Mr. C. S. Dawson, accountant, Woolwich Chambers, Fir Vale Road, Bournemouth, as trustee, with a committee. It was stated that the cash claim would be withdrawn.

Bankruptcy Proceedings

C. E. Ross and **T. E. Perks** (trading as Ross & Perks), electrical engineers, 166, Piccadilly, W.—The receiving order in this case was made on a creditor's petition dated February 2nd and the first meeting of creditors was held on February 16th at London Bankruptcy Buildings. It was stated that the debtors entered into partnership in 1930 and took out patents for cooking equipment, a fish-frying machine and an electrical self-registering dart board. The liabilities are estimated at £2,750 and the debtors do not admit insolvency as they consider the patents are of greater value than the amount of the debts. A resolution was passed for Mr. R. Mountstephen, C.A., 15, Eastcheap, E.C., to act as trustee.

S. Herzberg, electrical dealer, 11, Victoria Dock Road, Canning Town, E.—The public examination of this debtor was held at the London Bankruptcy Court on February 16th before Mr. Registrar Kean. The statement of affairs showed liabilities of £3,830, of which £2,581 was expected to rank for dividend, against assets of £1,505. Debtor said that at first his trading was very successful, but later he became unable to obtain further supplies of bakelite parts necessary for the electrical goods which he manufactured, with the result that he was not in a position to execute orders. To that factor he mainly attributed his failure. Judgments were obtained against him and eventually bankruptcy ensued. The examination was adjourned.

E. G. Kelf and **L. F. Brewer,** lately carrying on business as "E. G. K." at 4, High Road, Willesden Green, N.W., radio dealers.—At the London Bankruptcy Court on February 23rd the debtor Kelf applied for his discharge before Mr. Registrar Kean. The Official Receiver reported that the receiving order was made in October, 1938. The statement of affairs disclosed liabilities of £439 and the assets had realised £6. The debtor attributed his failure to bad trade in the district and to losses arising as a result of defaulting customers. The discharge was suspended for six months.

J. Stubbs and **J. A. P. Boulton,** carrying on business in partnership under the style or firm of John Stubbs & Co., 39, Bootham, York, electrical engineers.—The adjourned public examination took place at the Law Courts, Clifford Street, York, recently. The joint statement of affairs filed showed gross liabilities of £21,381, of which £11,865 was expected to rank for dividend. The assets were estimated to realise £3,811, and there was a deficiency of £8,054. At the previous hearing Stubbs said that negotiations had been commenced for a limited company to take over the partnership business and capital of £7,000 had been promised. The Official Receiver now told the debtor that he had been in touch with the people whom debtor said had promised the money, but they denied that there was any such arrangement. Debtor said that he had certain correspondence to show otherwise. Just after these arrangements were started he met with a flying accident, as a result of which he was prevented from attending to the business. In reply to the Official Receiver, Boulton said he had been mainly concerned with the technical side of the business, and it was only in October last year that he realised the partnership was in serious difficulties. The failure was attributed to the consequences of Stubbs' accident and lack of capital. The examination was again adjourned.

J. W. Watson, 154, Aldborough Road, Seven Kings, electrical engineer.—The first meeting of creditors was held at 29, Russell Square, London, W.C.1, on February 22nd. Debtor had prepared a statement of affairs showing gross liabilities of £2,075, of which £1,923 was expected to rank for dividend, with net assets of £30, leaving a deficiency of £1,893. Debtor attributed his failure to drawing in excess of profits, losses sustained while trading in partnership, underestimating due to delay in completing contracts and poor trade. The case being a summary one was left in the hands of the Official Receiver as trustee.

R. W. Bradley and **B. R. Bradley** (W. Bradley & Sons), electrical contractors, 75, York Road, Woking.—Trustee, Mr. F. S. Salaman, 1 and 2, Bucklersbury, London, E.C.4, appointed February 16th.

H. M. Brown, electrical engineer (Wood & Co.), 97, St. Helens Street, Ipswich.—Trustee, Mr. J. B. Sanderson, 17, Museum Street, Ipswich, appointed February 16th.

F. H. Bennett, radio dealer, 52, Oakfield Road, Ilford.—Payment of debts in full and 4 per cent. interest on February 22nd at 7, Warwick Court, Gray's Inn, London, W.C.1.

C. R. Miskin (Miskin & Rice), Bush House, Aldwych, W.C.2, lately carrying on business at 31, Windmill Street, London, W.1, electrical contractor.—Discharge suspended for six months until July 27th, 1939.

J. C. N. Eastick and **L. E. K. Eastick** (J. J. Eastick & Sons), wireless factors, 118, Bunhill Row, London, E.C.—Last day for receiving proofs for dividend March 24th. Trustee, Mr. N. W. Osborne, 11-12, Finsbury Square, London, E.C.2.

F. Arrowsmith, radio dealer, 34, Great Moor Street, Bolton, and at Bury, Accrington and Blackburn.—Last day for receiving proofs for dividend March 11th. Trustees, Mr. A. O. Miles, 76, Cross Street, Manchester, and Mr. A. T. Eaves, 47, Mosley Street, Manchester.

C. W. Watson, electrical and wireless engineer, 33, Rainhall Road, Barnoldswick, Yorks.—Last day for receiving proofs for dividend March 11th. Trustee, Mr. W. F. Cresswell, 71, Manningham Lane, Bradford.

R. A. Bowles, radio dealer, 82, Oriel Drive, Aintree, Liverpool, lately trading at 2, Sefton Road, Litherland, Liverpool.—First and final dividend of 1s. 11d. in the £, payable February 28th at Government Buildings, Victoria Street, Liverpool.

Company Liquidations

Penarth Electric Lighting Co., Ltd.—Winding up voluntarily. Liquidators, Messrs. F. J. Cursons and T. H. Underhill, 88, Kingsway, London, W.C.2.

British G.W.Z. Battery Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. M. C. Davidson, 32, Bishopsgate, London, E.C.2.

H. D. Switchgear Co., Ltd.—Meeting March 25tth at "Kingscote," Becot, Walsall, Staffs, to receive an account of the winding-up by the liquidator, Mr. P. A. Dilger.

Dissolution of Partnership

Garratt Electric & Radio Co., electrical contractors and dealers, 374, Garratt Lane, Earlsfield, S.W.18.—Messrs. G. Cooper and P. C. Lefort have dissolved partnership.

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 15th:—

E.R. Plugs. No. 586814. Class 13 (III). Sparking plugs.—E.R. Plugs, Ltd., Regamoid Works, Angel Road, Edmonton, N.18.

Dingley Dell. No. 603705. Class 11 (IV). Electric hand and table lamps.—Allbright Electric Co., Ltd., 2-5, Dingley Place, City Road, E.C.1.

Esodia. No. 603736. Class 11 (IV). Electric lamps (ordinary).—Edison Swan Electric Co., Ltd., 189-191, Charing Cross Road, W.C.2.

Objections against either of the following proposed marks may be entered within one month from February 22nd:—

Versilent. No. 581605. Class 50 (III). Articles made wholly or principally of asbestos for sound, heat and electrical insulating purposes; adhesive textile tape impregnated with an electrical insulating medium, &c.—Versil, Ltd., Rayner Mills, Liversedge, Yorks.

Unitaire. No. 602802. Class 11 (IV). Air conditioning apparatus.—The Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., U.S.A. (British representative, G. Raymond Shepherd, 2, Norfolk Street, Strand, W.C.2).

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Blackmore or Blakemore private generating plant.
Loc-Drop lift indicator.
Havet rock drill.
Hinder infra-red ray lamps.
Marvel rotating window signs.
Victor chain lamp adaptor.

ELECTRICITY SUPPLY

Electricity for Small Holdings at Bishop Auckland. Burnley's Prepayment Hire-purchase Policy. Local Generation at Lossiemouth. Rhyl to Discontinue Assisted Wiring.

Aberdeen.—MEETING INCREASED DEMANDS.—The Electricity Committee has approved extensive additions to mains and sub-station plant, involving an expendiure of about £62,000. Mr. A. Gardner, the electrical engineer, proposes that the transformer kiosk at Duthie Terrace shall be replaced by a granite built sub-station to house three 1,000 kVA transformers and distributing switchgear for the Mannofield district. The cost of this replacement is £8,576. He further recommends the erection of a granite built sub-station with four 1,500-kVA transformers and switchgear for the Queen's Cross district at a cost of £15,770. The erection of a transformer kiosk and 6,600-V cable in the Richmondhill district will cost £14,011; and another of the larger extensions is the laying of low-voltage AC mains in Brighton Place and Balmoral Place at a cost of £9,831.

Bearpark (Co. Durham).—CHEAPER ELECTRICITY.—The Bearpark Colliery Co. has reduced its electricity charged by ½d., making the cost 5½d. per kWh.

Bishop Auckland.—ELECTRICITY FOR SMALL HOLDINGS.—The Durham County Agricultural Committee has accepted an offer by the North-Eastern Electric Supply Co., Ltd., to provide a supply of electricity to houses on small holdings. The County Council will make a contribution of £250 towards the cost.

Bolton.—SODIUM LIGHTING.—The Lighting Committee is to extend lighting by sodium vapour lamps at a cost of £1,500.

Bradford.—LOAN FOR EQUIPMENT.—Application is being made by the Electricity Committee for permission to borrow £75,000 for cookers, £125,000 for electrical apparatus, and £30,000 for meters.

Burnhopefield (Durham). — COLLIERY ELECTRIFIED. — The Friarside Colliery changed over from steam to electricity on February 27th. Two new electric haulage engines and a new electric winder have been installed.

Burnley.—PREPAYMENT HIRE PURCHASE.—Recommendations recently made by a special sub-committee which would preclude the Gas and Electricity Departments from continuing their hire-purchase activities through prepayment meters have not been adopted by the General Purposes Committee. If the Council approves the two departments will still continue their hire-purchase facilities by prepayment meter, subject to the agreements being brought into line with the Hire Purchase Act. The periods for the payment of instalments on appliances let on hire purchase by both departments will be from one to seven years, except in special cases. Appliances may be let out on hire purchase for terms of one to three years (cash prices plus 10 per cent.), five years (plus 15 per cent.), seven years (plus 22½ per cent.), and ten years (plus 30 per cent.).

LOAN.—The Electricity Committee is seeking permission to apply for sanction to borrow £8,000 for expenditure on unspecified sub-stations and equipment during the ensuing three years; also £30,000 for mains extensions and services during the next two years.

Clitheroe.—RURAL SUPPLIES.—The electrical engineer has been authorised to supply electricity to Hanson, Hancocks, Drake House, and Brocklehurst farms and application is to be made for sanction to borrow £410 for the purpose.

METERS.—Application is to be made by the Electricity Committee for sanction to borrow £1,000 for the purchase of meters.

Coventry.—POWER STATION EXTENSIONS.—The Electricity Committee is to acquire land for extensions at the Longford power station.

Durham.—OVERHEAD LINE.—The County Council has granted an application by the North-Eastern Electric Supply Co., Ltd., for the erection of an overhead line over part of the Winston estate.

Hampshire.—HOSPITAL PLANT.—The County Council is to improve the electricity plant at the Knowle mental hospital at an estimated cost of £1,200.

Kettering.—AIR RAID PRECAUTIONS.—The necessity of maintaining electricity supplies in an emergency has led the Town Council to apply for a grant in connection with the provision of a new extra-high-voltage switch-house at Rockingham Road at an estimated cost of £9,000. The electrical engineer will have the co-operation of the local A.R.P. officer to arrange the provision of the necessary equipment and protection at the works, and a list of sub-stations is to be prepared showing the protection recommended against splinters and incendiary bombs.

CORBY SUPPLY.—When Corby becomes an urban district on April 1st electricity charges will be made by the Kettering Electricity Department on the urban instead of the rural basis.

Lesbury (Northumberland). — INHABITANTS REJECT ELECTRICITY PLANS.—Residents in Lesbury have rejected a proposal to bring electricity to the village because, it is understood, it would mean an increase of 3d. in the rates.

London.—POPLAR.—The Electricity Committee has considered the question of street lighting improvements and an opportunity has occurred to modernise the main road lighting in Bow Road and East India Dock Road in conjunction with the substitution of trolley-buses for tramcars. The proposed improvement forms part of the complete scheme of reorganisation of the street lighting in the borough, which has been included in the Council's five-year programme of capital expenditure. It is anticipated that the cost of the works proposed will be in the neighbourhood of £10,000. The Electricity Committee has approved terms with the London County Council for supplying of electricity to the Millwall estate, Will Crooks estate and Gaselee Street area.

ST. PANCRAS.—The Electrity Committee is to extend mains at a cost of £1,758.

WESTMINSTER.—The City Council is to floodlight the Adelphi Building from standards erected in Victoria Embankment Gardens.

Lossiemouth.—ELECTRICITY INQUIRY.—An inquiry into the position in regard to electricity supplies at Lossiemouth was held by the Electricity Commissioners on February 23rd. The Town Council had applied for power to extend its present generating station by the installation of an additional 185-kW oil-engine driven DC generating set, and for power to borrow the sum of £3,288 for the extension. The Council had received an offer from the Grampian Electricity Supply Company to provide electricity in bulk, the supply to be subject to an agreement to include provision by the Council of a minimum annual revenue of £1,000 over a period of seven years. Such a supply, it was stated, could be made available within three months from the date of the completion of the agreement. The inquiry was conducted by Mr. A. N. East. Mr. W. Colvin, town clerk, said he hoped to be able to show that the acquisition of additional plant was more economical than the terms offered by the Grampian Electricity Supply Co. Baillie Maclean, on behalf of the Town Council, said they were fully confident that Mr. Trail, the burgh engineer, who had been with them since the inception of the undertaking twenty-five years ago, could continue to produce electricity cheaper than they could buy it in bulk supply. Mr. T. J. Mullan, on behalf of the Grampian Company, made it clear that he and his colleagues were attending the inquiry because they felt the company could give electricity to Lossiemouth at a more economical rate than the municipality could generate it. Mr. Trail said acceptance of the company's offer would mean the scrapping of the whole distribution system in the town. He added that he considered the terms quoted by the Grampian Company to be excessive. He was convinced that no substantial saving would be effected by having a partial bulk supply.

Minehead.—AREA EXTENSION.—The Minehead Electric Supply Co., Ltd., is extending its area of supply to include the Quantock Hills villages of Holford and Kilve.

Morecambe.—FUTURE OF ILLUMINATIONS.—It is suggested by the chairman of the Finance Committee that the proposed expenditure of £12,000 on illuminations may have to be reduced in order that essential services shall not be affected.

Newbury.—METER TESTING.—The Wessex Electricity Co., Ltd., is to erect a meter-testing station in Oxford Road.

Penrith.—SUPPLY COMPANY MERGER.—No objection is to be offered by the Penrith Council to the proposal of the Penrith Electric Supply Co., Ltd., for the company to be merged in the associated Mid-Cumberland Electricity Supply Co., Ltd. the whole concern to be known by the latter name.

Port Talbot.—SUPPLY FOR TIN-PLATE WORKS.—A special supply of electricity will be given to the Mansel tin-plate works, Port Talbot, in connection with the extra plant which is to be installed. This new plant is to be used for the cold rolling of aluminium from alloy slabs into sheet of size and thickness suitable for the aircraft industry.

Salford. — SUB-STATION. — The Electricity Committee is to erect a sub-station in Upper Park Road, Broughton.

Rhyl.—LOANS.—The Urban District Council is making application for consent to borrow £18,543, as follows:—To defray the cost of new plant, £1,772; high- and low-voltage mains, £7,575; consumers' apparatus, £4,773; meters, £4,092; erection of buildings, £330.

ASSISTED WIRING TO BE DISCONTINUED.—The Electricity Committee, having considered the provision of the Hire Purchase Act so far as it applies to assisted wiring, has resolved that the scheme be discontinued from April 1st.

Sedgefield.—OVERHEAD LINES.—Following consultations with a representative of the North-Eastern Electric Supply Co., Ltd., the Rural District Council has approved amended plans by the company for the supply of electricity to Chilton Lane and Ferryhill by means of overhead lines.

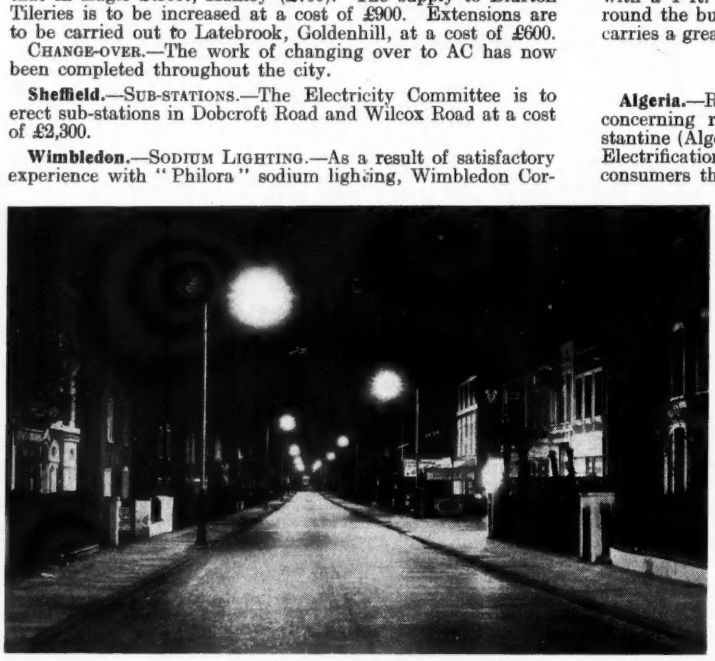
Stoke-on-Trent.—The Electricity Committee is to improve the supply in Werrington Road, Bucknall, at a cost of £600 and to other housing sites at a cost of £1,310.

DISTRIBUTION.—Mains in Abbey Road, Hanley, are to be diverted at a cost of £2,300. The Electricity Committee is also to augment the supply in Charles Street (£500) and improve that in Eagle Street, Hanley (£700). The supply to Blurton Tileries is to be increased at a cost of £900. Extensions are to be carried out to Latebrook, Goldenhill, at a cost of £600.

CHANGE-OVER.—The work of changing over to AC has now been completed throughout the city.

Sheffield.—SUB-STATIONS.—The Electricity Committee is to erect sub-stations in Dobcroft Road and Wilcox Road at a cost of £2,300.

Wimbledon.—SODIUM LIGHTING.—As a result of satisfactory experience with "Philora" sodium lighting, Wimbledon Corporation has made several extensions to its schemes. The accompanying photograph shows a section of Hartfield Road lighted with 140-W "Philora" sodium lamps in No. 527/780 "Lineal" refractor lanterns supplied by Holophane, Ltd. These fittings are mounted 26 ft. high and spaced 121 ft. apart with a 4 ft. overhang. Hartfield Road is used as a by-pass round the busy Wimbledon shopping centre and consequently carries a great deal of traffic.



Sodium lighting at Hartfield Road, Wimbledon

Overseas

Algeria.—RURAL ELECTRIFICATION.—Interesting information concerning rural electrification in the department of Constantine (Algeria) has been published by the Governor-General. Electrification has been organised in such a way that it is the consumers themselves, instead of the supply companies, who undertake the work of distribution. Seven syndicates and three agricultural co-operative organisations have been formed since 1929 to buy electricity from the producers at high voltage and distribute it themselves. The importance of the work accomplished in the last ten years is shown by the fact that eighty-seven of the 114 communes in the department are supplied with electricity.

France.—ELECTRICAL PRODUCTION IN 1938.—Our Paris correspondent reports that although final production figures for 1938 have not yet been made known, it is possible to obtain a fairly accurate estimate of the development of the industry in 1938. Production for the year, is believed to have reached about 20,000 million kWh, representing an improvement of about 6 to 7 per cent. over 1937. One of the characteristics of the past year was the unusual increase in thermal production, due to the drought in April and May.

Northern Ireland.—BELFAST UNDERTAKING DEVELOPMENTS.—Mr. F. H. Whysall, the city electrical engineer and general

Farm Electrification in N. America

By H. E. M. Kensit, M.E.I.C.

IN the United States there were in 1935 some 6,422,000 occupied farms, and 1,331,000 such farms (31 per cent.) now have an electrical service.* For this statistical survey the United States is divided into two areas approximately east and west of the 100th meridian, which is just about the centre of the continent.

The large use of electricity for irrigation pumping in the west involves steady use for long periods and makes the consumption per customer much larger and the price per kWh much lower than in the east for farming under ordinary conditions. The great majority of the farm services in the United States are from the lines of private companies, but the proportion served varies very largely in different States.

The highest proportion of farms receiving electric service in the east is in Rhode Island with 98.5 per cent., followed by Connecticut with 72 per cent. and Massachusetts with 66 per cent.; in the west California comes first with 105.6 per cent., this excess being due to some of the farms being irrigated areas with no dwelling, and Utah comes next with over 89 per cent. In both the east and west areas the proportion of farms receiving service falls in some States to 10 per cent. or even less. The approximate total figures for the whole country are as follows:—

	No. of farms served.*	Sales in million kWh.†	Sales per farm.†	Total Revenue.†	Revenue per farm, 1937.	Revenue per kWh in pence.
East ...	998,850	902.5	865	£9,020,000	£9.84	2.36
West ...	332,147	1,617.5	4,417	£6,220,000	£19.16	0.90

Electric service to farms has made rapid progress in the United States. In the last decade the total number served has increased 2¼ times and in the last year by 19 per cent. Much of the recent progress has been due to assistance from the Rural Electrification Administration and other government funds under the "New Deal," this having aggregated £33,000,000 to date. Some 70,000 miles of new rural lines have been thus financed and the average cost per mile has been brought down to about £185.

* As at June 30, 1938. † Estimated on 10 months of 1938.

In Canada, with an area about the same as the United States but only one-twelfth of the population, the conditions are far less favourable for rural supply, but substantial progress has been made in some of the provinces, particularly in British Columbia, Ontario and Quebec. At the census of 1931 British Columbia contained nearly 26,100 farms and the latest figures show 5,850 farms served, or 22¼ per cent. of the total. The census definition of a farm in Canada includes any tract of land of one acre or more under crop or employed for pasturage, so that the number of farms of a kind to take electric service and actually taking it are apt to be a comparatively small proportion of the whole.

In Ontario the Hydro-Electric Power Commission supplies much the greater part of the settled portion of the province, an area of some 200,000 square miles, though there are a few small power companies. The Commission, being a provincial organisation and not subject to taxation, has shared this benefit by special efforts over a number of years to extend the rural supply by liberal bonuses.

The province, through the Commission, pays 50 per cent. of the total cost of all equipment from the nearest distribution centre without requiring any repayment, it loans up to $1,000 at 6 per cent. interest for the installation on the property, and it bears any loss from the low charges for service until such time as the revenue from that rural district (there are some 170 separate and independent rural districts) becomes sufficient to repay such loss.

With this assistance the Commission's figures indicate that electric service is supplied to about 42 per cent. of the total number of farms in its area. The year 1937 showed record expansion in this direction with the construction of 2,300 miles of additional primary lines and a total of well over 13,000 miles.

In the province of Quebec the largest company, the Shawinigan Water and Power Co., supplying over an area of more than 15,000 square miles, has shown great enterprise, for without any outside bonus and subject to heavy taxation it has extended its rural service to 25 per cent. of all farms within its area, and at prices that appear to average lower than any in North America, and do not yield any profit—the company considers that the loss is negligible compared to the goodwill created.

manager, has submitted a statement of capital expenditure required for distribution works which will become necessary owing to increased demands. He recommends application for sanction to a loan of £45,000 for mains, transformers and switchgear.

TRACTION

Blackpool.—TRAMCARS.—The Finance Committee has approved a loan application of £23,706 for the purchase of twelve tramcars.

France.—ELECTRIC LOCOMOTIVES.—Trials have recently been carried out which foreshadow a speeding up on the railways, states *Reuter's Trade Service* from Paris. Among the most important are those on the Paris-Bordeaux electric line with the "2.D2" locomotive, eight of which are being built to haul fast trains from Paris to Irun. These engines have a weight of 130 tons distributed over two bogies and four driving shafts. The adhesion weight, which is 80 tons, can be increased when necessary to 88 tons by means of suitable ballasting. They are equipped with four double electric motors, each driving an axle by means of spring transmission of the "cup drive" type. The engines are streamlined and will haul an 800-ton train at a speed of 81 m.p.h.

South Wales.—PLEA FOR TROLLEY-BUSES.—At the annual dinner of the South Wales and Monmouthshire Branch of the Institution on Structural Engineers on Friday Mr. M. C. Harrison, chairman of the Branch, said that he could not understand why local authorities in South Wales, dependent as they were on coal, went over to oil for transport. It would help the coal trade very much if use were made of trolley-buses. If an emergency arose the Government would take all the oil, and transport, except for the people using coal, would be difficult and perhaps would cease altogether.

COMMUNICATIONS

Great Britain.—TELEVISION IN CINEMAS.—It is reported that as a result of the successful reception in cinemas of the Boon-Danahar fight television broadcast officials of the Gaumont British Picture Corporation and Baird Television, Ltd., have decided to go ahead with production of television apparatus to be installed in 350 cinemas. At the Baird company's factory at Sydenham over 17,000 sq. ft. of floor space is to be added.

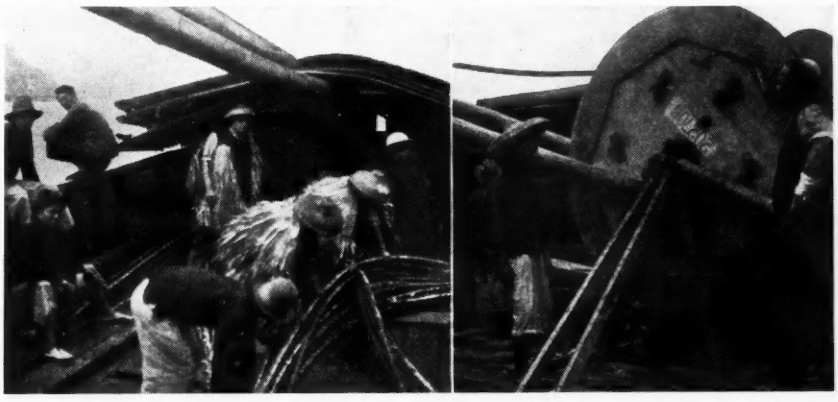
B.B.C. FINANCE.—The annual report of the British Broadcasting Corporation (H.M. Stationery Office, price 6d.) comprehensively surveys the services rendered and includes the balance sheet for 1938, during which year the number of licences issued increased by 429,300 to a total of 8,908,900. The net licence income was £3,431,104 (an increase of £556,060), the total income having increased by a sum of £443,977 to £3,800,051.

Of each 10s. licence fee the Post Office retains a percentage that is liable to revision every two years. Of the balance the Treasury retains one quarter, but in 1938 Parliament voted an additional allocation to the B.B.C. of 8 per cent. of the net licence receipts for the fiscal year 1937-38 in respect of 15 months' expenditure to March, 1938, on television and foreign language broadcasts. For the same purposes the 1938-39 addition will be 75 plus 15 per cent.

Revenue expenditure during 1938 amounted to £3,534,795, of which programmes accounted for £1,892,081, while maintenance of plant, power, salaries and expenses of engineering staff, development and research cost £673,855. Administration, salaries and expenses absorbed £165,267, leaving a balance of £11,399. A sum of £103,000 was transferred from licence revenue in respect of capital expenditure on two short wave transmitters for foreign language broadcasts.

Cable-laying in China

EXPEDIENCIES sometimes resorted to in cable laying in remote parts where proper equipment is not available are well illustrated by an undertaking carried out in China by the Felten & Guilleaume Carlswerk A-G, Köln, Mülheim. It consisted in the laying of 17,500 metres of submarine-type cable, with about 400 metres at each end on land and the remainder in water. In places the water was so shallow that even flat-bottomed junks could not be towed over it without danger of sticking in the mud.



Unreeling the cable on the floor of the junk for laying in the shallow part of the river, and one of the reels supported on a primitive rack

The cable was transported in seven lengths, varying between 840 and 1,635 metres and weighing between 4 and 7 tons. It was impossible to find sufficiently powerful handling facilities to move drums of such weight, and jacks on which they could be supported during laying were not available.

It was necessary, therefore, to load the drums on to junks by means of inclined planes and levers. Rough supports made of timber in triangular form were bolted to the floor of the junks and the drums raised up on to them by inclined planes and levers.

In principle, the cable was laid by towing the junks carrying the reels of cable across the river by tugboats, but one stretch of shallow water in the centre of the river, about 800 metres wide, was crossed by pulling the junk across the river with cables working on capstans. The cable was unreeled and laid out on the bottom of the junk; the drums and all unnecessary objects were then removed to give the junk the least possible draught. An anchor was dropped into the river above 200 metres in front of the junk, and a steel cable fastened to it wound round a capstan on the front of the junk. In this way the craft was drawn across the shallow section.

On the shore stretches the water was so shallow that even this method could not be used, and the cable had to be laid by hand. The junk was anchored and the end of the penultimate section of cable made fast to the vessel. The last section was then carried through the water by Coolies, who dragged it up the shore until it had been entirely played out. The two ends remaining on the junk were then spliced and lowered overboard.

In spite of the fact that the job was carried out with almost no equipment, apart from splicing tools, with a crew consisting of a foreman, a splicer and the rest unskilled labour, it was possible to complete the job within a period of only five weeks.

Legal

AT the Harwich Petty Sessions recently a charge of obtaining electricity by fraudulent means, brought by the Corporation against Albert Arthur Lynch, a petty officer cook in the Navy, was dismissed as not being proved.

It was stated that there was a shilling slot meter for lighting and a quarterly meter for heating, and it was contended that there was a deliberate act to obtain electricity through the heating meter for three lights at 1d. per kWh instead of 8d. per kWh. The defendant said there was nothing on the meter to say he should not use it in this way. He was ignorant of the fact.

In answer to Comdr. Denton, who asked whether there was anything to tell a stranger to the town that he could not use electricity from the power plug for lighting, the Town Clerk said there was not, except that he obtained electricity at so much for heating and so much for lighting and for that there were different meters put in the house.

In dismissing the case the chairman said that perhaps the Corporation should consider some means of making the regulations known to all consumers.

It is stated that the Corporation proposes to appeal against the decision.

FINANCIAL SECTION

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares.

New Companies Registered

Ismay Cables, Ltd.—Private company. Registered February 25th. Nominal capital, £100. Objects: To carry on the business of manufacturers of and dealers in cables, wires and accessories, &c. Subscribers: J. Stewart and H. Birch, both of 41, Lothbury, E.C.2. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Anderton & Clift, Ltd.—Private company. Registered February 18th. Capital, £1,000. Objects: To carry on business as mechanical, electrical and general engineers, metal and alloy makers, &c. Directors: H. Clift, 6, Staplehall Road, Northfield, Birmingham, 31; and G. F. Anderton, 158, Victoria Road, Handsworth, Birmingham, 21. Registered office: Crescent Works, 8, Allcock Street, Birmingham, 9.

Steelcraft Engineering Co. (Wolverhampton), Ltd.—Private company. Registered February 22nd. Capital, £1,000. Objects: To carry on the business of electrical welding service engineers, manufacturers of electrical plant and equipment, workers in metals and minerals, steel makers, ironfounders, &c. First directors: J. H. Pettinger and Mrs. A. M. Pettinger, both of 147, Compton Road, Wolverhampton; and C. Marsland, address not stated. J. H. Pettinger is permanent chairman and managing director. Registered office: Phœnix Works, Commercial Road, Wolverhampton.

G. Knewstub, Ltd.—Private company. Registered February 24th. Capital, £500. Objects: To acquire the business of a radio and electrical engineer carried on by G. Knewstub at Chesham Road, Amersham, Bucks, and to adopt an agreement with G. F. N. Knewstub, trading as G. Knewstub. Directors: G. F. N. Knewstub, 6, Highfield Close, Amersham; and A. R. B. Farrow, Conway, The Ridgeway, Amersham. Registered office: Chesham Road, Amersham, Bucks.

Schofield & Tanner, Ltd.—Private company. Registered February 24th. Capital, £100. Objects: To carry on business as electricians, mechanical and general engineers, &c. Directors: W. Davies, 2, Haughton Hall Road, Denton, near Manchester; W. Beresford, 72, Windsor Road, Denton, near Manchester; and W. Bromley, 5, Kensington Grove, Denton. Registered office: 32, Kennedy Street, Manchester, 2.

Electronic Engineering Services, Ltd.—Private company. Registered February 25th. Capital, £1,000. Objects: To carry on the business of radio, electrical, aeronautical, automobile, mining, chemical, civil, mechanical, consulting and general engineers, designers and manufacturers of radio, electrical and other plant, radio, electrical and business consultants, &c. Directors: W. J. Brown (permanent) and Mrs. N. K. Brown, both of Danesmoor, Swakeleys Road, Uxbridge, Middlesex; and G. Hay, Pipers Corner, Copperkins Lane, Amersham, Bucks. Registered office: 45, London Wall, E.C.2.

Boreham's Car Electrical Service, Ltd.—Private company. Registered February 18th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in magnetos, dynamos, armatures, motors, radiators, batteries, contacts, insulators and insulating materials, electrical plant, electrical, wireless and motor engineers, &c. F. G. L. Boreham, "St. Martins," Hinksey Hill, Berks, is permanent managing director so long as he holds 600 shares. Secretary: A. M. Boreham. Solicitor: Cyril L. Teal, 6/7, Turl Street, Oxford.

Applied Sciences, Ltd.—Private company. Registered February 13th. Capital, £500. Objects: To acquire and turn to account patents and inventions; to carry on the business of electrical and mechanical engineers, including the construction of electric and photo-electric devices operating at low pressure; consulting and steel constructional engineers, ore smelters, glass manufacturers, &c. The directors are: R. C. G. Slazenger, 11, Princess Gardens, S.W.7; and E. G. H. Mobsby, 44, Little Heath, Charlton, S.E.7. Registered office: Camden Row, Blackheath, S.E.3.

V. J. Copas, Ltd.—Private company. Registered February 13th. Capital, £3,000. Objects: To acquire the business carried on at Wembley, Middlesex, by Victor J. A. Copas, and to carry on the business of mechanical and electrical engineers, machinery, tool and instrument manufacturers, metal workers, &c. The directors are: A. S. Hollings, "Greendale," Greenland Road, Selby Park, Birmingham, 20, and four others. Solicitors: Hooper & Fairbairn, 1, Priory Street, Dudley.

John Leech (Electrical Contractors), Ltd.—Private company. Registered February 23rd. Capital, £500. Objects: To carry on the business of electrical contractors, engineers, electrical manufacturers, public works contractors and builders, &c. Subscribers: J. E. Leech, 14, Maple Road, Leytonstone, E.11; and Miss I. R. M. Day, 120, Wallwood Road, Leytonstone, E.11. J. E. Leech is the first director. Registered office: 16, Colman Street, E.C.2.

Leeves & Allen, Ltd.—Private company. Registered February 22nd. Capital, £500. Objects: To carry on the business of electricians, battery engineers, manufacturers of and dealers in radio and television apparatus, &c. Directors: R. J. Leeves and Mrs. J. I. Leeves, both of 61, Madeira Avenue, Bromley, Kent; and B. Buckingham, 167, Penhill Road, Bexley. Secretary: J. I. Leeves. Registered office: Market Square, Bromley, Kent.

Comparing Steam Efficiencies

CONVENIENT criteria of performance either for a turbo-generator unit, complete with feed heaters and extraction and boiler feed pumps (bounded by the limits of the stop valve exhaust flange and h.p. heater outlet), or, alternatively, including the boiler and all auxiliaries are given in paper No. 5186, by J. F. Field, published by the Institution of Civil Engineers. Correspondence on the paper can be accepted up to March 15th.

Applied to the modified Rankine cycle, using superheated steam and feed heating, the formula of ideal heating efficiency is shown to be the difference between heat supplied under feed heating conditions per lb. of water and absolute temperature of condensate multiplied by the difference in entropy between initial steam and feed-water as the numerator over heat supplied under feed heating conditions per lb. water as the denominator.

Where intermediate steam reheating is employed, the numerator becomes the difference between heat supplied under feed-heating plus reheating conditions per lb. of water and absolute temperature of condensate multiplied by the difference in entropy between reheated steam and feed water, while the denominator becomes the heat supplied under feed-heating plus reheating conditions per lb. of water. The formulæ are used to compare the performances of various generating stations.

Returns of Electrical Companies

Statements of Capital

Ferro-Concrete & Electrical Construction, Ltd.—Capital, £10,000 in 2,500 redeemable preference and 7,500 ordinary shares of £1. Return dated November 1st. 750 preference and 2,700 ordinary shares taken up. £3,450 paid. Mortgages and charges, nil.

Electric Sign Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 13th. All shares taken up. £1,000 paid. £4,000 considered as paid. Mortgages and charges, nil.

Bullers, Ltd.—Capital, £400,000 in 20,000 5 per cent. cum preference and 20,000 ordinary shares of £10. Return dated December 14th. 15,000 preference and 15,593 ordinary shares taken up. £150,070 paid on 15,000 preference and 7 ordinary shares. £155,860 considered as paid on the remainder. Mortgages and charges, £132,100.

J. R. Halliwell, Ltd.—Capital, £1,000 in £1 shares. Return dated December 14th. 875 shares taken up. £875 paid. Mortgages and charges, nil.

Impex Electrical, Ltd.—Capital, £14,000 in £1 shares. Return dated December 16th. All shares taken up. £14,000 paid. Mortgages and charges, nil.

Implitico, Ltd.—Capital, £3,000 in £1 shares. Return dated October 17th. All shares taken up. £3,000 paid. Mortgages and charges, nil.

Insular Electric Lamp Works, Ltd.—Capital, £5,000 in 500 shares of £10 each. Return dated December 20th. 100 shares taken up. £20 paid. £980 considered as paid. Mortgages and charges, nil.

Furness Electrical, Ltd.—Capital, £500 in £1 shares. Return dated September 21st. 430 shares taken up. £119 paid. £311 considered as paid. Mortgages and charges, nil.

Leonard J. Ive, Ltd.—Capital, £1,000 in £1 shares. Return dated December 21st. 500 shares taken up. £500 paid. Mortgages and charges, £1,000.

Mortgages and Charges

Weldrics (1922), Ltd.—Charge on all surplus moneys in hands of Receiver for debenture holders and all book debts, present or future, and all securities for the same, dated February 13th, 1939, to secure £110 and other sums due or to become due from the company to the chargees (John M. Tucker, John C. M. Tucker and Harold A. Turner, all of 12a, Finsbury Square, E.C.).

Keith Blackman, Ltd.—Deposit on February 15th, 1939, of deeds of freehold property at Tottenham Hale, E., to secure all moneys due or to become due from the company to the Bank of Scotland.

Bective Electrical Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated February 6th, 1939, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Omega Lampworks, Ltd.—Debenture charged on the company's property, present and future, including uncalled capital, dated February 14th, 1939, to secure £10,500. Holder: Mrs. E. F. Owston, "Sylvans," Tilford Road, Farnham.

Receivers Appointed

Lustre Electric Lamps, Ltd.—R. H. Hopkins, of 418/422, Strand, W.C.2, was appointed receiver on February 14th, 1939, under powers contained in debenture dated May 5th, 1930.

Collins and Scott, Ltd.—A. E. Arbell, accountant, of 6 and 7, Old Steine, Brighton, was appointed receiver and manager on February 17th, 1939, under powers contained in debenture dated January 31st, 1938.

Torbay Electric, Ltd.—P. J. Tucker, A.S.A.A., of 34, Queen Street, Newton Abbot, was appointed receiver and manager on February 10th, 1939, under powers contained in debenture dated May 10th, 1938.

Increase of Capital

Enfield Copper Refining Co., Ltd.—The nominal capital has been increased by the addition of £29,900 in £1 ordinary shares beyond the registered capital of £100. This increase is for the purpose of acquiring that part of the undertaking of Enfield Rolling Mills, Ltd., relating to the business of copper refining.

Reports and Dividends

The Lancashire Electric Light & Power Co., Ltd., held its annual meeting on February 23rd, when Mr. G. Balfour (chairman), who presided, said that of their total load during the year under review only about 10 per cent. was absorbed by the textile industry. While they suffered a reduction in output of 16½ per cent. for textile purposes the increases from other consumers overtook this reduction and provided an overall increase of nearly 14 per cent. Under the agreement between the selected station owners in the north-west area and the Central Electricity Board for a ten-year period in a first accounting and settlement at the end of the first five years, they would receive between £40,000 and £45,000. The sum of £40,000 had been credited to revenue in the statutory company's accounts, and after providing for tax, the balance of £29,000 had been added to reserve and depreciation account of the statutory company. During the year they added 5,824 low voltage consumers, making a total of 56,879. The total number supplied direct from their mains or through bulk supply customers was 155,338, an increase of 3.6 per cent. on the figures for 1937. About 87 per cent. of their domestic consumers were supplied under the two-part tariff, and the average price for the whole of the domestic consumers was 1.31d. per kWh. The capital expenditure during the year amounted to £514,572, of which £226,228 was spent on the 50,000 kW plant at Kearsley, and £287,308 on distribution and mains, which included twenty-seven miles of new high-voltage and eighty-three miles of low-voltage cables. They had now a total of 860 miles of high-voltage and 1,162 miles of low-voltage cables and distributors in service. The simultaneous maximum load on all their stations was 182,254 kW, an increase of a little over 16,000 kW. Sales totalled 511,360,000 kWh, as compared with 449,000,000 kWh in 1937, and 266,500,000 kWh was exported to the C.E.B., a decrease of about 75,000,000 kWh.

The British Power & Light Corporation, Ltd.—Presiding at the annual meeting held on March 1st Capt. C. E. Benson (chairman) referred to the increasing burden of rates which they had to bear from which they received little direct benefit. He considered that the present method of determining assessments required alterations if any relief was to be obtained. With regard to the hydro-electric power stations of the North Wales Power Co., in 1938 the effective aggregate rainfall was fully up to the average of the records of the past fifteen years and enabled the company to generate 63 per cent. of its total requirements, as compared with 52 per cent. in 1937. The extensions and modifications of the hydraulic pipe lines at Dolgarrog were completed in October last. The number of new consumers added by their subsidiary companies was 9,000, bringing the total connected to 75,000 at the end of last year.

In North Wales the scheme of development in the central and northern parts of the island of Anglesey had been completed. Further schemes of development had been carried out by the Distribution Company, particularly in its eastern areas. In addition, important modifications and reinforcements had been made to the company's main transmission system. Supplies had been made available to upwards of twenty additional hamlets and villages in the areas of the English companies, and here again it had been necessary in certain areas to carry out important schemes of reinforcements and improvements of the main transmission systems to deal with the growth of business and particularly industrial supplies.

The Southern Railway Co.—Presiding at the annual meeting on February 23rd, Mr. R. Holland-Martin (chairman) said that in the electrified areas there was an increase in passenger receipts of £180,000. The capital spent on electrification in every case so far had earned a net income largely in excess of the interest required for the service of the loans. Of their more recent electrification schemes, Portsmouth No. 2—the route *via* Dorking, Horsham and Chichester—showed for its first six months of working an increase in gross receipts of 13.2 per cent. over those obtained by steam working. Sevenoaks showed a further increase of 5½ per cent.; Alton, Staines and Guildford *via* Woking an increase of 9 per cent., and Guildford to Portsmouth (Portsmouth No. 1) an increase of 9½ per cent. Referring to the Waterloo and City Railway, he said that they had ordered a complete new set of rolling stock which would augment the existing accommodation and would add to comfort, not only in seating, but in quietness of working. This should be ready by the end of the year. The last improvement, that of making three escalators at the Bank Station instead of two, required Parliamentary sanction.

The Mid-Southern Utility Co.—Presiding at the annual meeting on February 23rd, Mr. T. A. Braddock (chairman), in referring to the electricity department, mentioned that the connected load during 1938 was increased to the extent of 13,313 kW by the addition of 28,822 lamps, 1,791 cookers and cooking apparatus, 2,737 fires and radiators, 456 water heaters, 141 motors, and 856 miscellaneous appliances. They had also connected 4,224 new consumers during the year, and sales of electricity had increased by 25.9 per cent., notwithstanding certain increases which they had found it necessary to make in some of their tariffs.

The Rawlplug Co., Ltd.—Presiding at the annual meeting on February 22nd, Mr. J. J. Rawlings (chairman) said that the turnover during the year under review again showed a considerable increase both for home and export, and was a record. Not only had they a successful "Rawlplug," but they had many other fixing devices. They had also placed upon the market electric drills and a new electric percussion hammer. As regards the current year's trading, there were signs of an improvement in the political and economic position which encouraged the belief that they could look forward with confidence to the continued progress of the company.

The Llanelly and District Electric Supply Co., Ltd., reports a profit for 1938, including £1,975 brought in, of £85,135, and after appropriating £34,000 to depreciation and general reserve there is a balance of £51,135. It is proposed to pay a dividend on the ordinary shares for the year of 5½ per cent., less tax (same) and to carry forward £1,980. The report states that the operating profit of the electricity undertaking shows improvement notwithstanding considerably higher cost of coal and the depression in the local steel and tinplate industries, which also adversely affected the operating results of the traction undertaking. A resolution is to be submitted to the share holders at the annual meeting on March 6th for the creation of 200,000 new shares of £1 each, to be issued as and when required for further development.

Enfield Cable Works, Ltd., reports a net profit for 1938 of £185,250, as compared with £181,203 in the preceding year. These figures are struck after providing for directors' fees £945 (£1,667), depreciation £19,950, and £2,000 duty on increase of capital, but before tax reserve allocation. The final ordinary dividend is 10 per cent., making 16¼ per cent. (against 25 per cent. on smaller capital), reserve receives £25,000 and £19,690 is carried forward. Meeting: March 10th.

The Midland Counties Electric Supply Co. reports trading profits of the undertakings owned and operated by the company, after payment of tax, of £812,827, as compared with £767,352 in the previous year. Of this amount £383,200 has been appropriated in the accounts of these undertakings for depreciation and reserve. The balance of revenue account is £413,690 (against £374,183), which with £14,993 brought in makes £428,683 available. Reserve receives £80,964 and the final ordinary dividend is 5½ per cent., making 8 per cent., less tax (same). The balance carried forward is £15,162.

The Northampton Electric Light & Power Co., Ltd., reports a net revenue of £152,734 for 1938, as compared with £138,564 in the preceding year, after providing £109,538 for depreciation. To this is added income from investments (£8,044), making £160,778. After deducting debenture interest, tax and other sundries, it is proposed to pay a final ordinary dividend of 6 per cent., maintaining the distribution for the year at 10 per cent., and a bonus of 1 per cent. in recognition of the company's fiftieth year, and to carry forward £32,843. The report states that new low-voltage distributing mains have been constructed and the total length is now 460 miles. New extra-high-voltage mains of thirty-three miles bring the total to 615 miles. The total kWh sent out from the power station and sold to the Central Electricity Board was 107,331,520. Sales to the company's own consumers and in bulk to its associated companies amounted to 94,275,630 kWh, an increase of 10 per cent. The maximum load on the system was 33,850 kW. Meeting: March 3rd.

The Rushden and District Electric Supply Co., Ltd., reports a profit for 1938 of £15,007 as compared with £11,693 for 1937. It is proposed to pay a final dividend of 5 per cent. (against 5½ per cent.), making 9 per cent. for the year (same), and to carry forward £7,625 (against £4,017 brought in). The sales of electricity increased by over 26 per cent. to 10,697,866 kWh, and the maximum load was 5,070 kW.

Clarke, Chapman & Co., Ltd., report net profits of £80,070 for 1938, as compared with £77,228 in the preceding year. These figures are struck after providing for all charges and taxation and allowing £14,463 (against £13,609) for depreciation. The ordinary dividend for the year is 10 per cent. (same), reserve receives £21,480 (£20,000) and £27,934 is carried forward (against £19,390 brought in).

The Metropolitan Electric Supply Co., Ltd., reports a gross revenue for 1938 of £1,707,021, as compared with £1,576,894 in the preceding year, and a net revenue of £430,895, as against £455,506, to which is added interest and dividends on investments and sundry fees £241,622 and £161,826 brought in, making £834,343. The ordinary dividend for the year is maintained at 10 per cent. by the final payment of 7 per cent., and a bonus of 2 per cent. is also paid on the ordinary shares (same), leaving £131,452 to be carried forward. Meeting: March 7th.

Ismay Industries, Ltd.—In our last issue we reported Mr. Somers, the chairman, as saying that from John Ismay & Sons little profit could be expected for some time. This related to Sterling Electric Holdings, Ltd., and we are asked to state that John Ismay & Sons, Ltd., have now no connection with Ismay Industries, Ltd.

Hall Telephone Accessories (1928), Ltd., proposes to pay a final dividend of 5 per cent., plus a bonus of 5 per cent. both less tax, making 15 per cent. for the year. The distribution for 1937 was the same, but the interim dividend for that year was paid on smaller capital.

The North Metropolitan Electric Power Supply Co. proposes to pay a final dividend upon the ordinary stock of 6 per cent. actual, making 10 per cent. for the year ended December 31st, the same as for the previous year. A sum of £410,810 is to be placed to depreciation and reserve, £30,000 to contingency account, and £76,412 is to be carried forward (against £74,367 brought in).

The Consolidated Gas, Electric Light and Power Co. of Baltimore is paying a dividend of 90 cents per share for the quarter ending March 31st.

The Direct Spanish Telegraph Co. reports a net revenue for 1938 of £6,730, as compared with £7,152 in the preceding year, to which is added £1,723 brought in, making £3,453. The ordinary dividend for the year is maintained at 6 per cent., less tax, and £1,574 is carried forward.

The Yorktown (Camberley) and District Gas and Electricity Co. reports a gross profit for 1938 of £28,486 (against £24,584). The consolidated ordinary dividend for the year is 6¼ per cent. (same) and £11,530 is carried forward (against £11,326 brought in).

The Lancashire United Transport and Power Co., Ltd., reports a profit for 1938 of £108,181 (against £94,084 for 1937). The final ordinary dividend is 6 per cent. (7½ per cent.), making 10 per cent. for the year (same).

Pye (Ireland), Ltd., reports a net profit for 1938 of £4,119, as compared with £8,649 for 1937, plus £1,201 brought in. A dividend of 5 per cent., less tax, is to be paid (against 11 per cent. for 1937), and £1,250 is carried forward.

The Dublin United Tramways Co. (1896), Ltd., is paying a final dividend of 2 per cent., making 3 per cent. for the year (same).

The United Steel Companies of Sheffield have declared an interim dividend of 2½ per cent., less tax. This compares with an interim dividend of 3 per cent. in the previous year, but is payable on increased capital.

The North-Eastern Electric Supply Co., Ltd., is paying a final dividend of 4½ per cent. on the ordinary stock, maintaining the distribution for the year at 7 per cent.

The South London Electric Supply Corporation, Ltd., is paying a final ordinary dividend of 4 per cent., less tax, making 7 per cent. for the year (same). The net profits for 1938 were £53,568 (against £70,139 for 1937).

Th British Columbia Power Co. has announced a dividend of 50 cents on the class "A" shares for the quarter ending March 31st.

Crabtree Electrical Industries, Ltd., has declared an interim dividend of 5 per cent., less tax (same).

Ransome and Marles Bearing Co., Ltd., is to pay an interim dividend of 9 per cent. less tax (same).

Holophane, Ltd., is maintaining its interim ordinary dividend at 4 per cent., less tax.

The Mid-Cheshire Electricity Supply Co., Ltd., is to pay a first and final dividend of 8 per cent., less tax (same).

The Kent Electric Power Co. has declared a first and final dividend of 8 per cent., less tax (same).

The Newcastle and District Electric Lighting Co., Ltd., has announced a first and final dividend of 7 per cent. (same).

The Mersey Power Co. is paying a first and final dividend of 8 per cent., less tax (unchanged).

Cable and Wireless (Holding), Ltd., announces a dividend on the preference stock of 2¾ per cent., less tax, for the half-year ended December 31st.

Hoover, Ltd., in a preliminary statement, reports a net profit for 1938 of £338,515, as compared with £419,807 in the preceding year. The net profit has been arrived at on a comparable basis, but the directors point out that although the sales for 1938 constituted a record, the international crisis in the autumn affected very considerably the profits of the company. The ordinary dividend for the year is maintained at 25 per cent. less tax, by the final payment of 20 per cent.

The Bournemouth & Poole Electricity Supply Co., Ltd., has decided, subject to audit, to recommend a final dividend of 9 per cent. on the ordinary stock, less tax, making 15 per cent. for the year (unchanged). The net profits for 1938 are £104,001, as compared with £112,975 for 1937.

J. & F. Stone Lighting & Radio is again paying an interim dividend of 5 per cent., actual, less tax.

The Globe Telegraph & Trust has declared an interim dividend of 1¼ per cent., net (same).

Waste Heat & Gas Electrical Generating Stations, Ltd., is maintaining its dividend for the year at 8 per cent., less tax, by the final payment of 5½ per cent.

The Folkestone Electricity Supply Co., Ltd., has announced a final dividend of 6 per cent., making 10 per cent., tax free, for the year (same).

Stocks and Shares

TUESDAY EVENING.

THE recognition by this country and by France of General Franco has had a salutary effect upon Stock Exchange business and prices. Not long ago, the impression prevailed that success on the part of General Franco might possibly lead to fresh complications if Italy intervened, but in view of the present tranquil appearance of Continental politics, such previous apprehensions have quietly faded out—at any rate for the time being.

Investors and speculators are busily combing the markets in the search for profitable opportunities. Prices of industrial issues have gone ahead materially. Nor have the gilt-edged sections lagged behind in the general advance which is taking place. The Chancellor of the Exchequer, in his speech last Monday night, said that the coming Budget must reflect to some degree the none too prosperous conditions of the past year, but that there are definite signs of recovery.

Cable and Wireless has declared the full dividend on the 5½ per cent. preference stock, and this, taken in conjunction with previous buying of the combine's securities, served to give a fresh fillip to the quotations. A minor feature of the moment is the way in which shares in any companies connected with television are moving up. E. K. Cole, Baird Television, Pye, Electric and Musical Industries and several others, have advanced by reason of the increased attention drawn to television, partly through the present-day advertising campaign, partly through the impression that television will be introduced into cinemas in the near future.

Gilt-edged Strength

Second thoughts on the magnitude of the proposed Defence borrowing caused no wavering in the stoical attitude of the gilt-edged market. War Loan stands at 98, as compared with 97¼ on the day before the disclosure of the Chancellor's intentions. These provide, as is now generally known, for the borrowing of £350 millions in the coming financial year. They give more than a hint that additional taxation of a serious character is not in contemplation. The behaviour of the market confirms the idea that borrowed millions hold fewer terrors than the spectre of 1s. on the income tax. The impression grows that perhaps half the requirements will be financed through the medium of Treasury Bills, and that the Government will be in no hurry to come to the gilt-edged market for the balance. Coupled with the success of a new Corporation issue and the happier political feeling, these considerations help to explain a firmness in gilt-edged prices which has agreeably surprised most observers.

Industrial Markets

The implications of Sir John Simon's borrowing plans have sunk into the industrial markets with good effect on share prices. As in the gilt-edged market, it is the indicated relief from overburdening taxation that has given an impetus to enterprise. Some of the principal improvements have occurred in the shares of companies that seem readiest to the tax-collector's hand. This aspect apart, it is considered that the defence expenditure assures a satisfactory level of trade and employment in many sections of industry. Such considerations have not yet brought the big buyers into the market, and the fact that prices have risen substantially on a moderate volume of business is a sign of the shortage of shares on offer. It also demonstrates the possibilities that wait upon the advent of a really determined buying movement if this should materialise.

Electricity Supply

Another batch of satisfactory dividends and profits has combined with the better trend of general markets to cause all-round improvement in the electricity supply list. Metropolitans at 49s. 6d. lead the way with an advance of 3s. 3d., which ranks as almost spectacular in a market not usually given to sharp changes: the company's profits for 1938 are at a record level, although higher working expenses bring the net figure slightly below last year's. A 2 per cent. bonus is again added to the 10 per cent. dividend. County of Londons are 1s. 6d. at 46s.; the usual 10½ per cent. dividend is to be paid. The North Metropolitan dividend of 10 per cent. is maintained on a larger capital, and the shares are ⅞ better at 45s. Lancashire Electrics advanced 2s. 6d. further, to 33s. 9d., after news of the proposed issue of shares, the money obtained from which is required in connection with past and future expenditure. Electricity Supply Corporations at 51s. 3d., Scottish Power at 37s., and Yorkshire Electrics at 36s. 6d., are all 1s. or more to the good.

Equipment and Manufacturing

Electrical equipment shares continue to attract their full quota of the interest in industrial markets. After the sharp improvement of a fortnight ago, the tendency has held towards higher prices. General Electrics, at 80s., and Associated Electricals, at 43s., have gone further ahead. The yields on last year's dividends are down to the 5 per cent. on the former, and less than 4¾ per cent. on Associated Electricals. Crompton Parkinsons, at 19s. 3d., are 1s. 3d. better. Hall Telephones have improved by the same amount on the maintenance of the dividend at 15 per cent., and Ericssons, at 40s., are another firm spot in the telephone group. The strength of Walsall Conduits at 30s. 9d. is particularly noticeable; the final dividend is due in a few days' time. Others to show improvements of half a crown or more are Johnson & Phillips, at 40s., Chloride Electrical, at 80s., and Electric Constructions, at 35s. Vickers are at present up to 23s. 9d.; there are hopes that the process of writing-up the nominal value of the shares is to be carried a stage further, with 10 per cent. dividend maintained on the enlarged capital. English Electrics, at 32s., are quoted ex-rights to the new shares, which, offered at 20s., are changing hands at a premium of 12s. 6d. Proceeds of this issue are to be used, according to the chairman, to finance the growing volume of business; the issue is not connected with direct defence work. Profits from this work are to go towards the strengthening of the company's normal activities and not, it is noted, towards increasing the dividends.

Enfield Cable Results

Expectations were well satisfied with the Enfield Cable dividend and profits, the modest increase in the latter being achieved, as the report points out, in the face of difficult trading conditions. The dividend of 16¼ per cent. goes against last year's 25 per cent., but is equal to 26 per cent. on the capital as it was before the distribution of the 60 per cent. capital bonus. Consequently the company is paying out a little more than before in the dividend, which is covered by earnings with a margin of about 4 per cent. From the surplus, £25,000 is again transferred to reserves. The price of the £1 shares has hardened to 57s. 6d., which gives a return of £5 12s. 7d. per cent. on the new rate of dividend.

Traction and Transport

Home Railway stocks have been among the most active sections of the Stock Exchange. The better appearance of the weekly traffic returns has added to the good impression made by the companies' annual reports and by the chairmen's speeches. The rise of 6 points in Southern preferred, at 65½, is no more than typical of the week's movements among the more speculative stocks. Optimism has been further encouraged by the belief that a successful conclusion to the "square deal" negotiations is coming into sight. Elsewhere in the transport group, London Transport "C" stock has put on 2 points, to 72½, and British Electric Traction deferred 25 points, to 950. Bristol Trams, at 46s. 3d., and West Ridings, at 36s. 3d., are both higher. Among the overseas companies, there are signs of new interest in Anglo Argentine Tramways first preference, at 5s., Brazilian Tractions, at 9⅛, and Rio 5 per cent. bonds at 65. The last-named have gained 8 points on the week.

ELECTRICAL COMPANIES' SHARES

Prices, dividends and yields

Company.	1938. Highest.	1938. Lowest.	Dividend. Previous.	Dividend. Last.	Price Feb. 28.	Rise or Fall.	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	62/–	15	15	67/6	—	4 9 0
British Power & Light	30/9	24/6	7	7	28/6	+1/–	4 18 3
City of London	34/6	28/6	7½	7½	32/6	+6d.	4 13 9
Clyde Valley	42/6	33/–	8	8	37/6	+ 1/16	4 5 4
County of London	51/9	38/9	10½	10½	46/6	+ ⅛	4 11 5
Edmundson's :							
7% Pref.	33/3	30/–	7	7	30/–	—	4 13 4
Ord.	40/9	18/9	9	9	27/–	+1/–	—
Elec. Dis. Yorkshire	43/6	37/9	9	9	40/–	—	4 10 0
Elec. Fin. and Securities	51/9	49/–	12½	12½	46/3	—	5 8 3
Elec. Supply Corporation	55/–	50/–	12	12	51/3	+ ⅛	4 13 7
Isle of Thanet	21/3	18/6	4	4	20/–	—	4 0 0
Lancs Light and Power	35/–	26/–	7½	7½	33/9	+ ½	4 9 0
Llanelly Elec.	23/6	21/–	5½	5½	22/–	+6d.	5 0 0
Lond. Assoc. Electric	32/9	28/–	7	7	28/9	—	4 17 4
London Electric	36/3	32/–	7	7	33/–	—	4 4 10
London Power Deb. Red.	108¾	100	5	5	103½	—	4 16 6
Metropolitan	51/–	41/–	12	12	49/6	+3/3	4 17 0
Midland Counties	39/9	33/–	8	8	37/6	+6d.	4 5 4
Mid. Elec. Power	41/9	37/–	8	9	39/6	+9d.	4 11 2
Newcastle Elec.	31/9	27/6	7	7	28/9	—	4 17 4
North Eastern Electric :							
Ordinary	34/–	25/–	7	7	31/6	+1/–	4 9 0
7% Pref.	34/–	30/–	7	7	31/–	—	4 10 4
Northampton	47/6	43/9	10	10	46/3	+ 1/16	4 6 6
Notting Hill 6% Pref. (£10)	14½	13⅛	6	6	13½	—	4 12 4
North Met. Elec. :							
Ordinary	49/–	43/–	10	10	45/–	+ 1/16	4 9 0
6% Pref.	30/6	28/3	6	6	28/–	—	4 5 9
Richmond Elec.	30/6	28/–	7	7	28/9	—	4 17 5
Scottish Power	38/9	32/–	8	8	37/–	+2/–	4 6 6
Southern Areas	22/9	18/6	4½	5	20/6	+	4 17 7
South London	32/6	31/–	7	7	30/–	—	4 13 4
West Devon	23/3	21/3	5	5	1⅛	—	4 9 0
West Glos.	19/–	16/9	2	2	20/–	—	2 0 0
Yorkshire Elec.	42/–	36/9	8	8	36/6	+1/6	4 7 6
Overseas Electricity Companies							
Atlas Elec.	4/6	2/6	Nil	Nil	2/6	—	—
Calcutta Elec.	44/3	36/3	12*	10*	37/6	—	5 6 7
Cawnpore Elec.	40/–	35/–	10	10	31/3	—	6 7 10
East African Power	28/3	22/6	7	7	25/–	—	5 14 0
Jerusalem Elec.	26/9	23/3	5	6	24/–	—	5 0 0
Kalgoorlie (10/–)	12/–	9/6	7½	7½	10/3	—	7 6 4
Madras	34/6	28/9	8*	8*	30/–	—	5 6 8
Montreal Power	31⅛	26⅛	1½	1½	32½	−⅜	—
Palestine Elec. "A"	31/9	27/–	7½*	7½*	28/3	+9d.	5 6 1
Perak Hydro-electric	25/3	17/–	7	6	17/6	—	6 17 2
Shawinigan Power	23½	16½	85cts.	83cts.	21⅛	−1	—
Tokyo Elec. 6%	65½	39	6	6	55½	−5	10 16 2
Victoria Falls Power	76/3	55/–	12	13½	66/3	—	4 1 7
Whitehall Investments Pref.	22/3	15/–	7½	7½	18/3	—	8 4 6
Public Boards							
Central Electricity :							
1950–70	115⅜	97	5	5	108½	—	4 12 2
1955–75	118½	100	5	5	112½	—	4 9 0
1951–73	111	95	4½	4½	104	—	4 3 4
1963–93	101	85	3½	3½	92½	—	3 14 10
London Elec. Trans. Gtd.	93½	88	2½	2½	87	—	2 17 1
London & Home Counties, 1955–75	112⅜	97½	4½	4½	107	—	4 4 1
Lond. Passenger Transport :							
A	119½	104⅜	4½	4½	111½	—	4 0 9
B	122⅜	105	5	5	111½	—	4 9 8
C	84	68	4½	4	72½	+2	5 10 6
West Midlands Joint Elec., 1948–68	115¼	102⅜	5	5	112	—	4 9 3
Telegraph and Telephone							
American Tel. & Tel.	160	114	9	9	168½	+	5 6 6
Anglo-Am. Tel. :							
Pref.	115½	100½	6	6	100½	—	6 0 0
Def.	28	23	1½	1½	22½	—	6 13 4
Anglo-Portuguese	23/6	19/3	8	8	22/–	+9d.	7 5 7
Cable & Wireless :							
5½% Pref.	104	76½	4½	5½	87½	+5	6 5 7
Ord.	67⅜	34	—	4	45½	+5	8 15 10
Income	102½	99	—	—	100	—	4 0 0
Canadian Marconi $1	6/6	3/9	—	Nil	4/9	+3d.	—
Globe Tel. & Tel. :							
Ord.	32/6	26/3	5½*	7½*	26/3	—	5 14 3
Pref.	27/6	23/9	6	6	26/3	—	4 11 5
Great Northern Tel. (£10)	42½	34	20	20	36½	—	5 9 7
Inter. Tel. & Tel.	12½	5⅜	Nil	Nil	10½	+⅜	—
Marconi-Marine	30/6	21/6	10	7½	24/6	—	6 2 4
Oriental Telephone Ord.	59/3	2½	12*	12*	2 7/16	—	4 18 3
Radio Corpn.	9½	4⅜	8	6	7⅜	+½	—
Telephone Props	13/9	11/3	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	7/6	5	6	9/–	—	3 6 8
Western Union	34¼	17	2⅜	—	25½	—	—
Traction and Transport							
Anglo-Arg. Trams :							
First Pref.	11/–	2/6	Nil	Nil	35/–	+ 1/16	—
4% Inc.	31	8	Nil	Nil	12	+1	—
British Electric Traction :							
Def. Ord.	1060	675	5	6	950	+25	—
Pref. Ord.	175	150	8	8	160	—	5 0 0
Bristol Trams	45/–	34/3	8	10	46/3	+ 1/16	5 16 9
Brazil Traction	14½	7⅛	$1	—	9⅝	+ ⅛	—
Calcutta Trams	26/9	21/6	8	8	25/–	—	6 10 8
Cape Elec. Trams	18/6	15/6	5	6	17/6	—	6 17 2
Lancs Transport	35/3	29/3	10	10	35/–xd.	—	5 14 3
Mexican Light :							
1st Bonds	39	16½	5	5	25	—	—
Rio 5% Bonds	91	47	5	5	65	+8	7 13 10
Southern Rly :							
5% Prefd.	87	48	5	5	65½	+6	7 12 8
5% Pref.	116	83	5	5	91½xd.	+3	5 9 3
T. Tilling	60/–	36/6	10	10	2⅜	—	4 4 3
Tilling & B.A.	57/–	46/–	10	9*	51/3	—	3 10 4
West Riding	46/3	30/6	10	10	36/3	+⅛	—
Equipment and Manufacturing							
Aron Electricity Ord.	40/3	31/–	15	15	31/3	+ 1/16	9 12 0
Assoc. Elec. :							
Ord.	45/3	32/–	10	10	43/–	+2/–	4 13 0
Pref.	38/9	35/6	8	8	35/6	—	4 10 0
Automatic Telephone & El.	43/–	35/–	5	10	42/6	+½	4 14 1
Babcock & Wilcox	44/–	32/6	10	10	42/6	+ 1/16	4 14 1
British Aluminium Ord.	54/–	40/–	10	12½	55/–	—	4 11 0
British Insulated Ord.	95/9	77/–	20	20	4 1/16	—	4 12 10
British Thermostat (5/–)	16/–	9/–	17½	18½	15/–	+6d.	6 3 4
British Vacuum Cleaner(5/–)	35/9	27/–	40	40	22/–	—	—
Brush Ord.	5/6	4/9	Nil	Nil	5/–	—	—
Callender's	5⅛	78/6	20	20	85/–	—	4 19 0
Chloride Elec. Storage	77/9	61/–	15	20	80/–	+½	5 0 0
Consolidated Signal	116/–	75/–	36½	36½	85/–	−1/9	8 11 8
Crabtree (10/–)	29/–	22/–	17½	17½	23/9	+ 1/16	7 7 4
Crompton Parkinson :							
Ord. (5/–)	32/3	18/9	12½	15	19/3	+ 1/16	—
E. K. Cole (5/–)	8/9	4/6	5	10	7/–	+9d.	7 2 10
Elec. & Musical Industries (10/–)	16/3	9/–	10	5	13/–	+ 1/16	3 17 0
Electric Construction	36/–	31/–	10	12½	35/–	+½	7 2 10
Enfield Cable Ord.	5 5/16	46/–	25	16½	57/6	+½	5 12 7
Electrical Switchgear (10/–)	27/–	22/6	16	16	26/3	—	6 2 0
English Electric	33/–	24/6	10	10	32/–xr.	—	6 5 0
Ensign Lamps (5/–)	14/3	11/3	—	25	14/–	—	8 18 6
Ericsson Tel. (5/–)	2 5/16	31/–	25*	25*	40/–	−⅛	3 2 6
Ever Ready (5/–)	26/3	16/6	45	35	23/–	+6d.	7 12 2
Falk Stadelmann	34/3	27/–	10	10	26/3	− 1/16	7 12 4
Ferranti Pref.	27/6	25/–	7	7	25/–	—	5 12 0
G.E.C. :							
Pref.	34/–	31/3	6½	6½	30/–	−⅛	4 6 8
Ord.	79/3	67/–	17½	20	80/–	+1/–	5 0 0
Greenwood & Batley	27/6	19/–	7	15	26/3	—	11 8 2
Hall Telephone (10/–)	24/6	18/3	15	15	21/3	+ 1/16	7 1 2
Henley's (5/–)	21/–	16/–	15	20	21/3	+6d.	4 14 1
4½% Pref.	23/–	22/–	4½	4½	22/6	—	4 0 0
Hopkinsons	40/–	32/6	10	12½	40/–	—	6 5 0
India-Rubber Pref.	21/9	20/3	5½	5½	21/3	—	5 3 6
Intl. Combustion	5/8	4½	32½	32½	5½	—	5 18 2
Ismay Industries (5/–)	6/9	1/–	6	6	10½d.	—	—
J. Lucas	57/9	47/6	15	15	57/6	—	5 4 4
Johnson & Phillips	43/9	32/6	10	12½	40/–	+ 1/16	6 5 2
Lancashire Dynamo	72/3	53/–	20	25	65/–	+⅛	7 13 10
Laurence Scott (5/–)	12/–	9/–	7	15	11/9	+9d.	6 7 8
London Elec. Wire	35/–	28/3	12	7½	29/6	—	5 1 8
Mather & Platt	49/–	41/3	13½	13½	47/6	+½	5 13 8
Metropolitan Elec. Cable Pf.	22/–	21/–	5½	5½	21/3	—	5 3 6
Murex	93/9	66/3	20	20	80/–	+½	5 0 0
Pye Deferred (5/–)	12/–	8/–	5	25	9/–	+3d.	13 17 10
Revo (10/–)	36/3	30/–	12	17½	35/–	—	5 0 0
Reyrolle	62/6	49/–	12½	12½	53/9	—	4 13 0
Siemens Ord.	31/–	20/6	7½	7½	22/6	—	6 13 4
Strand Elec. (5/–)	6/–	4/–	5	10	5/3	—	9 10 6
S. Smith (1/–)	9/9	6/3	37½	50	8/9	+ 1/16	5 14 3
Switchgear & Cowan (5/–)	19/6	12/6	20	20	15/–	—	6 13 4
Telegraph Condenser (10/–)	18/9	12/–	5	5	10/–	—	5 0 0
Telegraph Construction	2½	36/–	7½	10	2 1/16	— 1/16	4 16 6
Telephone Mfg. (5/–)	9/9	7/–	9	9	9/–	+6d.	5 0 0
Tube Investments	89/6	70/–	23¾	23¾	87/6	—	5 8 2
Vactric (5/–)	9/9	4/6	10	4	3/3	—	6 3 2
Vickers (10/–)	27/–	17/6	10	10	23/9	+9d.	4 4 0
Westinghouse Brake	63/9	45/–	17½	17½	50/–	—	7 0 0
Walsall Conduits (4/–)	26/–	22/6	—	55	30/9	+3/3	7 4 0
West, Allen (5/–)	6/6	4/6	—	7½	6/3	—	6 0 0

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical specifications recently published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

12252. "Electric cables." Liverpool Electric Cable Co., Ltd., and J. T. Frost. April 29th, 1937. (500105.)

12387. "Television receivers." Scophony, Ltd., J. Sieger, and S. H. M. Dodington. April 30th, 1937. (500036.)

14502. "Television transmitting devices." Radioakt.-Ges. D. S. Loewe. June 16th, 1936. (499860.)

14751. "Electrical apparatus for discharging bombs from aircraft." C. Heber, and Mechanische Werkstatten Neubrandenburg Ges. May 27th, 1937. (Addition to 395568.) (499862.)

15134. "Suction nozzles for vacuum cleaners." Siemens-Schuckertwerke Akt.-Ges. May 30th, 1936. (500108.)

17820. "Electron-discharge devices." H. G. Lubszynski, H. Miller, and J. E. I. Cairns. June 26th, 1937. (499869.)

17948. "Electrical controlling devices for hydraulic accumulators loaded with compressed air." F. Krupp Grusonwerk Akt.-Ges. August 1st, 1936. (499871.)

17950. "Direct-current electric ship propulsion or the like systems." General Electric Co., Ltd., H. J. Coates, and R. G. Jakeman. June 28th, 1937. (499872.)

18067. "Road-traffic control systems." Siemens & General Electric Railway Signal Co., Ltd., and N. Herwald. June 29th, 1937. (499962.)

18211. "Multi-range tunable oscillators for radio and like receivers." Marconi's Wireless Telegraph Co., Ltd. June 30th, 1936. (499963.)

18301. "Photographic cameras with photo-electric exposure meters." H. Tonnies. July 1st, 1936. (500188.)

18485. "Nickel-plating of aluminium and its alloys." J. Frasch. July 2nd, 1936. (500113.)

18554. "Electron multipliers." F. J. G. Van Den Bosch. July 3rd, 1937. (500189.)

20232. "Electric vacuum switches for use in circuits controlled by physical conditions." R. Markus, and F. K. Smith (E. Kieback and P. Peter, trading as Kieback & Peter). July 21st, 1937. (499874.)

20741. "Thermionic valve and like circuits." Telefunken Ges. für Drahtlose Telegraphie. July 27th, 1936. (499877.)

20772. "Time bases for cathode-ray tubes." Mullard Radio Valve Co., Ltd., C. C. Eaglesfield and J. Archer. July 27th, 1937. (Cognate applications 33869/37 and 8690/38.) (499878.)

20889. "Rectifying arrangements employing discharge devices." Verrerie Scientifique. July 28th, 1936. (Cognate application 20890/37.) (500191.)

21049. "Photo-electric cells." British Thomson-Houston Co., Ltd., and G. S. C. Lucas. July 29th, 1937. (500044.)

21208. "Modulating arrangements suitable for use in carrier current signalling systems." Automatic Telephone & Electric Co., Ltd., and T. B. D. Terroni. July 30th, 1937. (500045.)

21274. "Wall-boxes and junction-boxes for use in connection with electrical wiring conduits." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and B. G. Harrison. July 31st, 1937. (500048.)

21316. "Electric battery lamps." Concordia Electric Safety Lamp Co., Ltd., and J. W. Jones. July 31st, 1937. (499967.)

21373. "Insulated electrical conductors." H. G. C. Fairweather. (Rockbestos Products Corporation.) August 3rd, 1937. (500257.)

21489. "Apparatus for temporarily laying electric cables." D. S. Kennedy. August 4th, 1937. (Cognate application 24489/37.) (500210.)

21513. "Electric control devices particularly electro-magnetic relays for controlling large capacity high voltage circuit-breakers." British Thomson-Houston Co., Ltd. August 4th, 1936. (500214.)

21534. "Electric arc lamps." Korting & Mathiesen Akt.-Ges. August 7th, 1936. (500261.)

21568. "Methods of amplifying electrical signals." Baird Television, Ltd., and D. M. Johnstone. August 5th, 1937. (500217.)

21616. "Furnaces for tempering or other heat treatment." W. J. Millar and Electric Resistance Furnace Co., Ltd. August 5th, 1937. (500263.)

21631. "Electric measuring and controlling apparatus." British Thomson-Houston Co., Ltd., and P. Mathews. August 5th, 1937. (500265.)

21639. "Photo-electric surfaces." Farnsworth Television, Inc. August 18th, 1936. (499891.)

21657. "Depositing electrode for electrical gas purification." M. Lehnen. August 6th, 1936. (500221.)

21715. "Image analysing means with multiple-spiral discs." Radio Akt.-Ges. D. S. Loewe. August 8th, 1936. (500225.)

21738. "Permanent magnets." Deutsche Edelstahlwerke Akt.-Ges. August 7th, 1936. (500227.)

21900. "Manufacture of gas-filled liquid impregnated electric cables." British Thomson-Houston Co., Ltd. August 8th, 1936. (499970.)

21941. "Electric hair dryers." W. H. Murad. August 9th, 1937. (500125.)

22119. "Thermionic valves." M-O Valve C., Ltd., and G. W. Warren. August 11th, 1937. (499971.)

22268. "Apparatus for recording the passage of vehicles." W. S. Every, R. Dell, and London Passenger Transport Board. August 13th, 1937. (499894.)

22344. "Telephone installations." C. Lehner, M. Gadesmann, K. Leichthammer, and H. Leichthammer (trading as Telefonbau und Normalzeit Lehner and Co.). August 20th, 1936. (500127.)

23431. "Auxiliary electrodes in electric discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges für Elektrische Glühlampen). August 26th, 1937. (Cognate applications 31334/37 and 5409/38.) (499897.)

23529. "Electrically insulating coating on metal surfaces and method of producing same. Allmänna Svenska Elektriska Aktiebolaget. October 28th, 1936. (500057.)

24142. "Dies for wire strand machines and for other purposes." Callender's Cable and Construction Co., Ltd., and G. M. Harris. September 3rd, 1937. (499898.)

25220. "Electrical apparatus for the transmitter of printing-telegraphs or like devices." N. Uchida, T. Uchida, and N. Uchida. September 24th, 1936. (499900.)

27201. "Television, facsimile telegraph and like systems." A. H. Blue and R. D. Wood. October 7th, 1937. (499988.)

27698. "Telegraph systems. Western Union Telegraph Co. October 21st, 1936. (499905.)

28463. "Electric cables." Callender's Cable and Construction Co., Ltd., L. G. Brazier, and G. M. Hamilton. October 19th, 1937. (499906.)

28546. "Insulated electric conductors." W. T. Henly's Telegraph Works Co., Ltd., W. C. Barry, and B. B. Evans. October 20th, 1937. (Cognate application 7733/38.) (499908.)

30561. "Heating elements for electrically heated ovens." Jackson Electric Stove Co., Ltd., and T. J. Lattimer. November 8th, 1937. (500135.)

34193. "Pillar supports of reading lamps and the like." Co-operative Wholesale Society, Ltd., and R. H. Line. December 10th, 1937. (499915.)

34328. "Electrical systems of remote control." General Electric Co., Ltd., J. E. Collyer, and N. C. Smart. December 11th, 1937. (500138.)

34324. "Systems of distribution of programmes of music, news, or the like." General Electric Co., Ltd., and A. A. Chubb. December 11th, 1937. (500139.)

34973. "Electric water-level indicators." P. Pairard. December 17th, 1937. (499997.)

1938

325. "Fusible elements for the protection of electric circuits." Callender's Cable & Construction Co., Ltd., and A. W. Metcalf. January 5th, 1938. (499999.)

749. "Electric cable sheathings." F. Wolfer. January 9th, 1937. (500074.)

2184. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 25th, 1937. (500142.)

2650. "Electric-discharge tubes, comprising cantilever springs." M-O Valve Co., Ltd., and G. W. Warren. January 27th, 1938. (500239.)

4315. "Circuit control arrangements of electro-magnet switches. H. J. Osborn and W. Sharp. February 11th, 1938. (Addition to 457829.) (500003.)

5172. "Multi-cathode-ray discharge device." Standard Telephones & Cables, Ltd. May 29th, 1937. (500005.)

7393. "Automatic frequency control in electric carrier signalling systems." Siemens & Halske Akt.-Ges. October 21st, 1937. (499922.)

7427. "Wireless direction-finding apparatus." Soc. Anon des Industries Radio-Electriques. March 10, 1937. (Cognate application 7428/38 and 7429/38.) (500006.)

9166. "Ignition plug for internal combustion engines." General Motors Corporation. March 27th, 1937. (500148.)

11884. "Cable connection sockets or glands for use with portable electric machines, such as used in mines and the like." C. Crofton & Co. (Engineers), Ltd., and H. B. Crofton. April 20th, 1938. (500155.)

12169. "Electrolytic condensers." Mallory Patents Holding Co., Ltd. November 1st, 1937. (500016.)

12173. "Sealing and mounting of electrolytic condensers and other electrical components." Mallory Patents Holding Co., Ltd. November 4th, 1937. (500157.)

13459. "Cathode-ray tubes." C. Lorenz Akt.-Ges. May 5, 1937. (500017.)

13621. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. May 8th, 1937. (499933.)

14041. "Electric-discharge tubes and circuit arrangements incorporating such tubes." Naamlooze Vennootschap Philips' Gloeilampenfabriken. May 14th, 1937. (500090.)

14695. "Methods of and apparatus for electrostatically generating direct-current power." Research Corporation. June 9th, 1937. (500161.)

16687. "Dry rectifiers and photo-electric cells." British Thomson-Houston Co., Ltd. June 5th, 1937. (Addition to 497034.) (Cognate application 16688/38.) (500094.)

18073. "Electrical connecting devices." British Thomson-Houston Co., Ltd. June 23rd, 1937. (499939.)

20209. "High-tension electric condensers." E. Rosenthal. July 7th, 1938. (500167.)

20323. "Photo-electric comparing devices." Soc. Francais des Regulateurs Universels Arca, and R. J. Sirretta. July 13th, 1937. (500168.)

20587. "Swivel mounting and clamping of battens carrying electrical fuses or other units." E. Weston. July 12th, 1938. (500023.)

20896. "Electron-discharge devices utilising secondary emission and electrode structures therefor." Electrical Research Products, Inc. August 26th, 1937. (500170.)

22029. "Apparatus for use in electric welding." Junkers Flugzeug und Motorenwerke Akt.-Ges. July 23rd, 1937. (500100.)

22036. "Apparatus for use in joining structural members together by electric welding." Junkers Flugzeug und Motorenwerke Akt.-Ges. July 23rd, 1937. (500101.)

23842. "Mounting for motor-compressor units in refrigerators." British Thomson-Houston Co., Ltd. August 25th, 1937. (500174.)

24914. "Method of joining a metal reflector to a glass globe." British Thomson-Houston Co., Ltd. August 24th, 1937. (500178.)

27289. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 22nd, 1937. (499949.)

27541. "Dry surface-contact electric rectifiers." British Thomson-Houston Co., Ltd. September 23rd, 1937. (500180.)

28642. "Permanent magnets." Deutsche Edelstahlwerke Akt.-Ges. August 7th, 1936. (Divided out of 500227.) (500031.)

1939

895. "Optical-projection apparatus for use with television receivers or otherwise." C. O. Browne and H. E. Holman. July 31st, 1937. (Divided out of 21290/37.) (500254.)

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Aberdeen.—March 9th. County Council. Electrical work at Insch housing estate. County Clerk.

Aldershot.—April 4th. Electricity Department. Extra-high and low-voltage cables and ordinary and prepayment meters for twelve months. (February 24th.)

Australia.—VICTORIA.—April 26th. State Electricity Commission. One 30,000-kW turbo-alternator for new station at Newport.

Barnoldswick.—March 13th. Electricity Department. P.i. cables for twelve months. (See this issue.)

Bexley.—March 15th. Electricity Department. One 10,000-kVA, one 5,000-kVA and three 1,000-kVA transformers, and switchgear. (February 24th.)

Bingley.—March 8th. Electricity Department. Single-phase, 250-A testing equipment. (February 24th.)

Birmingham.—March 13th. Great Barr Park Colony. Six months' supplies of electrical fittings. Clerk and steward.

Brighton. — March 9th. Electricity Undertaking. Tungsten filament electric lamps for street lighting and cables for twelve months. (February 24th.)

March 8th. Waterworks Department. Two electrically driven booster pumps, motors, control gear, &c., at Goldstone Works. Town Clerk, Town Hall (deposit £2 2s.).

Bristol.—March 13th. Electricity Department. 6.6-kV and 11-kV switchgear and transformers and low-voltage substation switchgear. (February 24th.)

Calderstones (NEAR BLACKBURN). — March 24th. Committee of Management. Heating services and electric lighting and telephones at the Institution for Mental Defectives. (February 24th.)

Cheadle and Gatley.—March 13th. Electricity Department. Extensions to 6.6-kV switchgear for the Bird Hall Lane substation. (February 24th.)

Chesterfield.—March 16th. Electricity Committee. Extra-high-voltage, p.i., lead-covered, steel-armoured cable, together with three-core pilot cable. (See this issue.)

March 16th. Public Lighting Committee. Street lighting columns complete with electrical equipment. (See this issue.)

Dublin.—March 15th. Electricity Supply Board. Power transformers for twelve months. (February 17th.)

March 29th. Board of Assistance. Installation of electric lighting at St. Patrick's Home, Pelletstown Ashtown. Plans from N. Mathews, engineer, 104, Grafton Street.

Durham.—March 11th. County Council. Electric mains and internal lighting at School Aycliffe Mental Deficiency Colony, near Darlington. T. T. Rees and R. Holt, architects, 64, Rodney Street, Liverpool, 1 (deposit £5 5s.).

Edinburgh.—March 16th. Conduits, frames and covers, fuse boxes and boards, disconnecting boxes, electric lamps and meters for twelve months. (February 24th.)

March 10th. Gas Department. General stores, including electrical materials, for twelve months. Town Clerk.

H.M. OFFICE OF WORKS.—March 15th. Electric light fittings at new Government buildings. (See this issue.)

Eston.—March 15th. Electricity Undertaking. Two kiosk sub-stations, complete with 300-kVA transformer and switchgear and one spare 300-kVA transformer. (See this issue.)

Exeter.—March 4th. Electricity Department. One economiser for the Basin generating station. (February 24th.)

Eyemouth.—March 16th. Town Council. Electric lighting of 40 houses at the Glebe site. Town Clerk (deposit £1 1s.).

Farnworth. — March 8th. Electricity Department. Stores and materials for twelve months. (February 24th.)

* **Hazel Grove and Bramhall.**—March 11th. Electricity Department. One 500-kVA and one 250-kVA transformer. (February 24th.)

India.—NEW DELHI.—March 28th. One 8,000-kVA turbo-alternator set complete with oil filter and steam purifier, condensing plant including auxiliaries and pipework and recorder for measuring condensate, together with exciter control pedestal, automatic voltage regulator and pipework. (T. 18749/1939.)*

Inverness.—March 11th. Town Council. Electric lighting installations at ninety houses (Muirton Nursery site). Town Clerk.

Keighley.—March 9th. Electricity Department. Cables, motors and starters, metal-clad switchgear, transformers and meters for twelve months. (February 24th.)

Kirkcaldy.—March 20th. Electricity Department. Aluminium cooking utensils, cooker control units, AC meters and domestic electric cookers for twelve months. (February 24th.)

Kirriemuir.—March 13th. Town Council. Electric lighting of thirty-six houses at Knowehead and Middlefield housing estate. Town Clerk (deposit £1 1s.).

Leyton.—March 13th. Electricity Department. Cables for twelve months. (February 24th.)

Lincoln.—March 11th. Electricity Department. Cables, joint boxes, cut-outs, meters and water-heaters for twelve months. (See this issue.)

London.—H.M. OFFICE OF WORKS.—March 17th. Dust-tight, waterproof and flameproof switchgear for Bridgend and Glascoed R.O.F. (February 24th.)

ST. MARYLEBONE.—March 22nd. Borough Council. Portable generating and pumping sets and fire fighting equipment. (February 17th.)

March 10th. Electrical wiring at Bridgend R.O.F. (February 24th.)

March 17th. Switchgear and transformers at Pembrey and Bishopton R.O.F. (February 24th.)

March 9th. Electric hand lamps (dry battery type). (February 24th.)

STEPNEY.—March 6th. Electricity Supply Undertaking. Extra-high and low-voltage, p.i. cables for twelve months. (February 17th.)

Lowestoft.—March 16th. Electricity Department. Low-voltage cable and two 300-kVA transformers. (See this issue.)

Maidstone.—April 10th. Committtee of Visitors. Lighting of footpaths at Kent County Mental Hospital, Barming Heath. (See this issue.)

Manchester. — March 6th. Electricity Committee. Emergency control panels for 6.6-kV switchgear at Stuart Street power station; mercury-arc rectifiers. (February 24th.)

Neath.—March 15th. Electrical Engineer's Department. Materials for twelve months, including electric lamps and meters. A. Lloyd, electrical engineer, 137, Windsor Road.

New Zealand. — WELLINGTON.—Public Works Department. March 28th. Power and control cables and accessories, service and terminal boxes and cable fittings at R.N.Z.A.F. Station, Ohakea. (T. 18463/39.)*

March 28th. Distribution switchboard and power and control cables and accessories at the R.N.Z.A.F. Station, Whanuapai. (T. 18460 and T. 18461/39.)*

May 2nd. 50-kW outdoor switchgear and steelwork. (T.Y. 18465/39.)*

May 23rd. Two bays of galvanised steelwork and switchgear at Waikaremoana lower power station. (T. 18598/39.)*

May 23rd. One 100-ton electric travelling crane. (T. 18454/39.)*

Oban.—March 6th. Burgh Council. Two 500-kW heavy-oil engine and alternator sets, cooling tower and auxiliaries. (February 17th.)

Oldham.—March 6th. Borough Council. Electric lighting installation at the Strinesdale housing estate (166 houses). T. Alker, Town Clerk, Town Hall (deposit £1 1s.).

March 13th. Electricity Committee. Extra-high and low-voltage cable. (See this issue.)

Portland.—March 11th. Electricity Department. Stores and materials for twelve months. (February 17th.)

Scunthorpe.—March 21st. Electricity Department. Materials for twelve months. (February 24th.)

South Africa.—CAPE TOWN.—March 1st. Electricity Department. Cables and jointing material. (T.Y. 18714/39.)*

March 2nd. Insulated copper wire. (T.Y. 18715/39.)*

JOHANNESBURG. — March 13th. Railways and Harbours Administration. Electrical signal material. (T. 18693/39.)*

April 17th. Nine four-ton electrically driven portal jib cranes. (T. 18979/1939.)*

PRETORIA.—March 30th. Posts and Telegraph Department. Eleven magneto motor-driven generators. (T.Y. 18859/39.)*

Southern Rhodesia.—GATOOMA.—March 16th. Town Council. Electrical meter-testing bench. (T. 18971/1939.)*

Southport.—March 9th. Borough Council. Extra-high-voltage sub-station switchgear and static transformers. (February 24th.)

Stoke-on-Trent.—March 8th. Electrical Engineer's Department. Extra-high-voltage sub-station switchgear and static transformers for twelve months. (February 17th.)

April 5th. 33-kV outdoor switching station at Burslem sub-works. (See this issue.)

Thornton Cleveleys.—March 13th. Electricity Department. Low-voltage and extra-high-voltage cables and cable tiles for twelve months. (See this issue.)

Wakefield.—March 6th. County Council of the West Riding of Yorkshire.—Electric lighting installation at new gymnasium at the Normanton girls' high school, and at extensions to the Silsden Hathfield Street school. Clerk of the County Council, County Hall.

Wallasey.—March 14th. Electricity Department. High-voltage cables, transformers, switch pillars and street lighting poles, fittings and mercury vapour lamps. (February 17th.)

Wembley.—March 20th. Borough Council. Electric lighting, heating and power installation at the Northern Fire Station, The Mall, Kingsbury. (See this issue.)

Wimbledon.—March 13th. Corporation. P.i. cables for twelve months. (See this issue.)

Wolverhampton.—March 14th. West Midlands J.E.A. 33,000-V and 6,600-V cables at Wolverhampton and Walsall generating stations. (See this issue.)

Workington.—March 10th. Electricity Department. Stores and materials for twelve months. (February 24th.)

Orders Placed

Bexhill.—Electricity Committee. Accepted. Transformers.—Lindley Thompson Transformer & Service Co. Low-voltage switchboard (£153).—W. Lucy & Co.

Billingham.—Durham County Education Committee. Accepted. Electrical installation at junior school (£309).—R. Robson.

Denbighshire. — County Council. Accepted. Electrical installation, telephones and lifts in connection with extensions to offices at Ruthin (£6,346).—McGoff & Vickers.

Dundee.—Cleansing Committee. Accepted. Electrically driven vehicle (£426).

London. — BATTERSEA. — Electricity Committee. Recommended. Twenty-four steel fluted lighting standards (£382).—B.T.H.

Housing Committee. Accepted. Electrical distribution boards and switchfuses for Mendip Road housing estate (£211).—Simplex Electric Co.

HAMMERSMITH.—Electricity Committee. Recommended. Thirty-two 2,200-V switches (£68 each), two 2,200-V transformer switches (£119 each, less £7 for non-erection), and two 2,200-V bus section switches (£113 each, less £5 for non-erection).—Ferguson, Pailin.

ST. MARYLEBONE.—Electricity Committee. Recommended. 500-kW low-voltage electrode steam boiler for baths (£880).—Sulzer Bros.

Health Committee. Recommended. X-ray equipment at dispensary (£1,357).—Watson & Sons.

POPLAR.—Contracts Committee. Recommended. Electric lifts at electricity showrooms (£1,169).—Marryat & Scott. Internal telephone (£211).—Reliance Telephone Co.

Middlesex.—County Council. Health Committee. Accepted. X-ray equipment at Ealing, Hounslow and Willesden dispensaries (£668 each).—Watson & Sons (Electro-Medical), Ltd. Nine electrically heated, stainless steel food trolleys (£566).—Hotlock, Ltd.

Tynemouth.—Town Council. Accepted. High-pressure switch for the electricity undertaking (£230).—A. Reyrolle & Co.

Wimbledon.—Electricity Committee. Recommended. Low-voltage switchgear (£1,534).—J. G. Statter & Co. High-voltage switchgear (£4,315).—English Electric Co. Switch panel (£314).—A. Reyrolle & Co. Completion of 33-kV cable to New Malden (£13,750).—B.I. Cables. One 33-kV switch unit at C.E.B. substation (£2,973) and two 11-kV switchgear units at Dukes Avenue sub-station, New Malden (£905).—A. Reyrolle & Co. One 15-MVA 33/10.3-kV Scott-connected transformer at Dukes Avenue sub-station (£7,239).—Hackbridge Electric Construction Co.

Worthing.—Electricity Committee. Accepted. Cables for three years.—Britannic Electric Cable & Construction Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Extensions to Rosemount school (£73,000); burgh surveyor.

Acton.—Factory, Brunel Road; Old Oak Factories, Ltd.

Bangor.—Store premises, High Street, for F. W. Woolworth & Co., Ltd., New Bond Street, London, W.1.

Basingstoke. — Houses (53) and two shops, near Sherborne Road; Monk & Cox, builders, Wrecclesham Hill, Farnham.

Bedworth. — Houses (48), Wooton estate; U.D.C. surveyor.

Birtley.—School (£47,425); Wright & Kellett, Ltd.

Bishop Auckland.—Clothing factory, St. Helen's estate, for North-Eastern Trading Estates, Ltd.; P. L. Browne, Son and Harding, architects, Pearl Buildings, Newcastle-on-Tyne.

Bolton.—Houses (44), Cameron Street; borough engineer.

Bournemouth. — Skating rink, Christchurch Road; Hawker, Mountain & Bailey. Additions to Alma Road school (£13,498); Bryant & Trowbridge.

Bradford.—Houses (166), Wapping, for the Housing Committee; J. A. Fletcher, city architect, Town Hall.

Branstone (BURTON-ON-TRENT). — Factory, Lichfield Road, Dunstall; H. Hawker.

Brierley Hill.—Houses (26), near Mill Street, and air-raid shelter in Municipal Buildings, for the U.D.C.; borough surveyor.

Brighouse. — Houses, Huddersfield Road; J. Jagger & Sons, Ltd., builders, Bailiffe Bridge.

Brighton.—Extensions, Royal Sussex Hospital (£30,000); J. L. Denman & Son, architects, 27, Queen's Road.

Bristol. — Houses (58), Bedminster estate, for the Corporation; city architect, Eagle House, Colston Avenue, Bristol, 1.

Briton Ferry.—Cinema for Saph & Hancock; Mercer & Vaughan, architects, 20, Wind Street, Swansea.

Burton-on-Trent. — School, between Tower Road and Clay Street (£39,800), for the E.C.; Councillor W. Hutson.

Chelmsford.—Houses (36), near Baddow Road; E. S. Legg. Houses (20), Second Avenue; J. Jackson & Co. Ward block (£25,000), Chelmsford and Essex Hospital, London Road; W. H. Pertwee & Howard, architects, The Institute, London Road.

Chester.—Houses (48), Saughall Road; A. H. Moorcroft. Extension to factory, Sealand Road; Arthol Manufacturing Co., Ltd.

Crook.—Additions to the Hippodrome Cinema, for S. Sheckman; J. H. Morton and Son, architects, Martins Bank Chambers, Fowler Street, South Shields.

Cumnock.—Houses (180), for T.C.; Mr. Forbes, architect.

Darlaston.—Houses (124), Bentley; Rubery Owens, Ltd., Lombard House, St. Charles Street, Birmingham, 3.

Dartford.—Houses (450), Princes Road estate; Franklin & Co. (Erith), Ltd., Erith Road, Erith.

Deganwy. — Hotel, West Shore (£200,000); W. J. Parry, North Wales Riviera Development Co., Ltd.

Devonshire.—Extensions to Crediton Hayward's school (£22,936), and additions to Loddiswill school (£1,070), for E.C.; director of education, Exeter.

Dundee.—Houses (554), school, shopping centre and community centre, for Corporation (£250,000); city architect.

Durham.—Shelters for the C.C. in connection with A.R.P. (£37,500); county surveyor. School, Gilliland (£54,832); I. Berriman.

Edinburgh. — Extensions to Western General Hospital (£254,000); city architect.

Exeter.—Extensions to Princess Elizabeth's Hospital; R. M. Challice & Son, architects, 7, Bedford Circus.

Eyemouth.—Houses (40), Glebe site, with electric lighting work, for T.C.; G. R. Wood, town clerk, Burgh Chambers.

Guildford. — Houses (36), Johnston Walk; C. C. Yeates & Co.

Hampshire.—Extensions to Farm Institute, Sparsholt (£26,800), for the County Council.

Hanley.—Cinema, Abbey Road; H. D. Ship.

Hetton.—Houses (86), East Rainton; U.D.C. surveyor.

Horden.—School (£32,624); D. Glen.

Houghton-le-Spring (Co. DURHAM).—Houses (148), for U.D.C.; J. Hunter, U.D.C. surveyor.

Inverness.—Houses (90), with electrical work, Muirtown Nursery site, for T.C.; Thomas Munro & Co., architects, 62, Academy Street, Inverness.

Jarrow-on-Tyne.—Houses (72); borough engineer. Cinema, York Avenue, for Smelt's Theatres, Ltd., Westgate Road, Newcastle-on-Tyne.

Kidderminster. — School (£25,527); Bridgwater Bros., Ltd., builders, Cradley Heath.

Kilmarnock.—Reconstruction and extension of Grange Public School (£21,932); county architect, Ayr.

Knottingley.—Houses (110), Broomhill and Tenter Close; U.D.C. surveyor.

Lanchester. — Isolation hospital (£160,000); W. & T. R. Milburn, architects, Sunderland.

London.—(DOWNHAM.)—School, Whitefoot Lane site (£31,046); Truett & Steel, Ltd., 71, High Street, Thornton Heath. (HAMMERSMITH.)—Clinic, Milson Road (£34,333); community centre, Becklow Road (£20,600); and welfare centre, Westway (£13,648); borough engineer. Extension to factory, 225, Goldhawk Road; Chesterton & Sons, 116, Kensington High Street, W.8. Extension to factory, Woodger Road; W. A. Lewis & Partners, 130, Regent Street, W.1. (UPPER CLAPTON.) — School, Oldhill Street; L.C.C., County Hall, Westminster Bridge Road, S.E.1. (WESTMINSTER.)—Offices, etc., Vincent Street and Marsham Street; T. P. Bennett & Son, architects, 43, Bloomsbury Square, W.C.1.

Long Benton.—Houses (106), Dudley, for the U.D.C.; W. Bean, architect, Council Offices.

Macclesfield.—Houses (45), London Road estate; E. Hamson, borough surveyor.

Manchester.—Development of Ringway airport (£291,070); city engineer; fire brigade premises, St. Joseph's school (£37,120); city architect. Hotel, on Piccadilly, Manchester, for City Properties (Manchester), Ltd.; Sir Robert McAlpine & Sons, Ltd., contractors, 50, Pall Mall, London, S.W.1. Houses (26), Newton Heath; Manchester Housing, Ltd.

Mansfield. — Houses (24), Debdale Road; R. R. Sorrell.

Middlesbrough.—Headquarters, Clarendon Road, for the members of the Middlesbrough Motor Club; Archibald & Archibald, architects, 23-5, Albert Road.

Morecambe.—Development of Wharfedale estate; Ormerod & Ogden.

Newbury.—Extensions to Albert works; Elliotts, Ltd.

Newcastle-on-Tyne.—Buildings, Portland Road, for the British Legion; Hetherington & Wilson, architects, County Chambers, Westgate Road. Town hall (£450,000); H. R. Collins and A. E. O. Geens, architects, 15, Westover Road, Bournemouth. Upholstery works, Barrack Road, for J. Taylor Dunford & Co.; J. Lunn & Sons, builders, St. Mary's Place. Works for the Burma Engineering Co., Ltd., Boyd Street; R. Burke, architect, Singleton House, Newcastle-on-Tyne. Workshop and offices for Heaton Foundry Co., Heaton Junction; W. Riddle, architect, 53, Denham Terrace, Wallsend-on-Tyne.

Northern Ireland.—(NEWRY.)—Houses (321) for R.D.C.; W. B. O'Donoghue, clerk, Newry.

Oldham.—Houses (224), Strinesdale estate; borough engineer.

Orpington.—Extensions to premises, High Street, for W. H. Smith & Sons, Ltd.

Oxford.—Houses (80) and flats, Slade and Cumberland estates; city surveyor.

Paignton.—Houses (69), Foxhole Road; Mid-Devon Estates, Ltd.

Plympton. — Development of 298-acre estate, Chaddlewood; Chaddlewood Estates, Ltd., Plymouth.

Pontypool.—Houses (94), Kemys Fawr estate, Griffithstown, and (20) Blaendare Road, for U.D.C.; F. R. Bates & Son, architects, 78, Bridge Street, Newport, Monmouthshire.

Pontypridd.—Houses (76) Rhydfelin estate; U.D.C. surveyor.

Prestwich.—Central town hall block (£24,000); U.D.C. surveyor.

Rotherham.—Houses (22), East Bawtry Road; Saville & Co.

Sheffield.—Development of Parkhead House estate, Eccleshall Road; Dyson & Co., Ltd.

Smethwick.—Extensions of fire station (£7,497) and town hall (£40,000); borough engineer.

Southall.—R.C. school, Cranleigh Gardens (£17,555); Westminster Diocesan Schools Commission.

South Shields.—Extensions to Town Hall for the T.C. (£18,000); Henderson Brothers, builders, Smith Street, Tyne Dock.

Stoke-on-Trent.—Enlargements of Chell school (£30,270); city architect. School near Federation Road; R.C. trustees. School, Newhouse estate, Bucknall; Stoke-on-Trent E.C.

Stretford.—Public library, King-st., for the T.C.; P. Hodkinson, Ltd., contractors, Devonshire Street, Stockport Road, Ardwick, Manchester.

Sunderland.—Five years' plan of developments for the Health Committee (£200,000); borough engineer.

Theale (NEAR READING).—Factory on site adjoining railway, near G.W.R. station; Imperial Tobacco Co., Bristol.

Thornaby-on-Tees.—Hotel; Kitching & Co., architects, 21, Albert Road, Middlesbrough.

Tunstall.—Shops and offices, Station Road; Northcliffe Newspaper Group, Ltd.

Tynemouth.—Cinema, Bridge Road; S. Pye.

Waddon.—Factory and offices, Hospital Road, for W. Howard Price, Ltd.

Wallsend-on-Tyne.—Houses (60), Rosehill estate; J. H. James. Cinema, Kings Road; E. M. Lawson, architect, Barras Buildings, Barras Bridge, Newcastle-on-Tyne.

Washington.—Houses (100), The Drive, for the U.D.C.; Reilly, builder, Wellbank Road.

Wellingborough.—Houses (56), John Lea Road; Drury & Co.

West Bromwich.—Enlargement of Kenrock College (£59,935), for the E.C.

Westerham.—Cinema, for A. P. Starkey.

Westward Ho.—Holiday camp for Knickerbocker World Travel Federation (£34,000).

Whitehaven.—Houses (134), Hensington estate; borough engineer.

Wingate (Co. Durham).—Cinema, for E. Miller; H. C. Garbutt, architect, 19, Albert Road, Middlesbrough.

Worcestershire. — Admission hospital, Barnsley Hill (£27,500), and nurses' home, Powick Mental Hospital (£21,000), for C.C.; A. V. Roe, county architect, Foregate Street, Worcester.

York.—Houses (32) and flats, Cemetery Road, Link Avenue and Dale Street; C. J. Minter, city engineer, Guild Hall.